Products finishing

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CONTENTS

An Invitation 7
from R. M. Goodsell, General Chairman, American Electro-Platers' Society

Convention Committee American Electro-Platers' Society 8

Official Program of the Twenty-Sixth Annual Electro-Platers' Convention 10

Efficient Plating Equipment Aids Merchandising 14
By Fred W. Vogel

Barrel Finishing of Metal Products 20
By H. Leroy Beaver

Sherardizing Process for Rust Proofing 32
By F. F. Schoen

The Finishing Forum 36

Finishes that Aid in Appearance and Utility 46

News of the Industry 48

New Plant Equipment and Materials 52

For Your Catalog Library 64

Index to Advertisements 66

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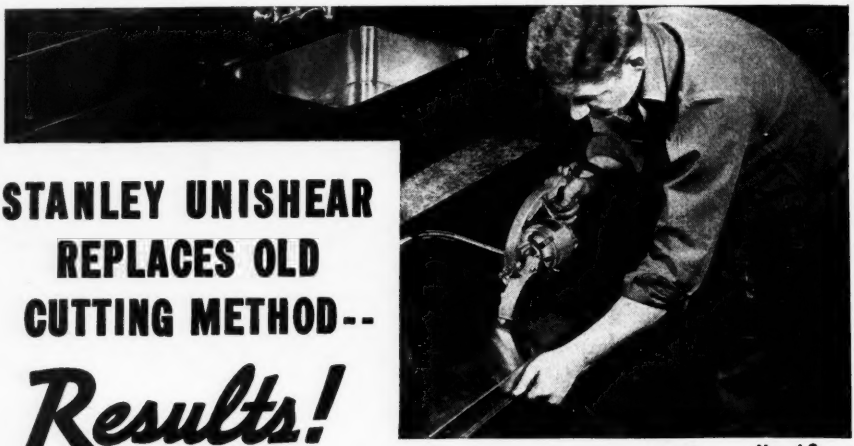

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STANLEY UNISHEARS

THE ELECTRICALLY DRIVEN HAND SHEARS

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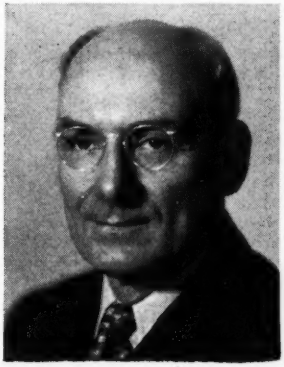
CINCINNATI, OHIO VOL. 2, No. 9

JUNE, 1938

An Invitation

from R. M. GOODSELL,
General Chairman, American Electro-Platers' Society Convention

The Milwaukee Branch of the American Electro-Platers' Society extends to the readers of PRODUCTS FINISHING a very cordial invitation to attend the Twenty-sixth Annual Convention which is to be held in Milwaukee, Wisconsin, June 13, 14, 15, 16, 1938 at the Schroeder Hotel.



R. M. GOODSELL

No renewal of invitation is necessary for those who attended the Silver Julibee Convention in New York City last year because all know that the great amount of benefit derived always acts as a stimulant to repeated attendance.

The committee in charge of the program has made every effort to make this Convention the most outstanding one ever to be held by the Society. An excellent educational program has been prepared and is ready for everyone who attends. The educational program has been given thoughtful consideration by the outstanding leaders in the electroplating field and will consist of a variety of papers covering every phase of the electroplating and finishing industry. The papers will be presented by the leading men in the finishing field.

In addition to the educational program, a very fine exhibit has

(*Above Left*) J. BYKOWSKI, TRANSPORTATION; (*Above Center*) R. GOODSELL, PUBLICITY; (*Above Right*) J. GEISSMAN, ENTERTAINMENT AND RECREATION; (*Below Left*) J. MISZEWSKI, JR., SHOP VISITATION; (*Below Center*) D. WITTIG, ADVISORY; (*Below Right*) H. BORNITZKE, EXHIBITS.

CONVENTION COMMITTEE AMER-

been arranged covering every phase of electroplating and finishing including the latest developments in this industry. The committee assures everyone that every minute of time spent at the Convention will be worth-while. Awards will be made for the best display by the chairman in charge of exhibits. A complete explanation of methods of operation will accompany each display.

If employed, be sure to show the Convention program to your employer as soon as possible. It is quite certain that he will realize the scope of our educational society and the benefit to be derived by attending the Convention in Milwaukee.

Since no convention is complete without the ladies, the ladies of the Milwaukee Branch will do everything to make this

ICAN ELECTRO-PLATERS' SOCIETY

(*Above Left*) V. SHEEHAN, EDUCATIONAL; (*Above Center*) DEXTER RHODES, REGISTRATION; (*Above Right*) P. J. RITZENTHALER, GENERAL PROGRAM; (*Below Left*) A. J. HERMANSEN, SECRETARY; (*Below Center*) R. STEUERNAGEL, TREASURER; (*Below Right*) F. J. MARX, BANQUET.

part of the program pleasant for those who attend.

Registration is the only requirement for admission to this Convention for anyone engaged in metal finishing. Membership in the American Electro-Platers' Society is not a primary requisite in order to be assured of a sincere and cordial welcome. By coming to the Convention in Milwaukee you will profit by making yourself a better informed plating foreman or finishing engineer and thus a more valuable aid to your company.

Sincerely yours,
Milwaukee Branch Convention Committee,

R. M. Goodsell
General Chairman.

Skyline of Milwaukee

Official Program of the 26th Annual Electro-platers' Convention

THE official program of the 26th Annual Electro-Platers' Convention at the Schroeder Hotel, Milwaukee, Wisconsin, has been announced as follows:

Sunday Afternoon, June 12

3:00 P. M. Registration, Hotel Schroeder.

Registration fees: Men $6, Ladies $4, which entitles registrant to book of tickets to be used for all functions and activities. Membership in Society is not necessary for registration.

Monday Morning, June 13

8:00 A. M. Registration, Hotel Schroeder.

9:00 A. M. Welcome to Delegates, Members and Visitors—R. M. Goodsell, General Chairman.

Welcome to Milwaukee.

Mayor Daniel Hoan or his representative.

Presidential Address.
Pres. A. B. Wilson.

Business Session.

Presentation of Credentials.
Submission of amendments to Constitution.

Monday Afternoon, June 13

1:30 P. M. Educational Session

1. Summary of Researches on Electrodeposition at the National Bureau of Standards.
   Dr. William Blum, U. S. Bureau of Standards.
2. Progress Report of Exposure Tests.
   Preparation of Plated Samples.
   P. W. C. Strausser, U. S. Bureau of Standards.
3. Survey of Metal Cleaning.
   Detroit Branch.
4. Advancements in Electro Plating in a Lifetime.
   Boston Branch.
5. Practical Demonstration of what happens in a Plating Barrel.
   Burton G. Daw, St. Louis.

Monday Evening, June 13

8:30 P. M. International Fellowship Club—Open House.

Crystal Ballroom—Hotel Schroeder.

This night will be devoted to a party for men and ladies sponsored by

International Fellowship Club.

We look forward to the pleasure of entertaining you.

We welcome you as our guest. A ticket is included in the Book of Tickets which must be used for admittance to this affair.

A Night of Entertainment

Dancing Refreshments

Tuesday Morning, June 14

8:30 A. M. Educational Session

1. Nickel Plating Zinc Base Die Casting in Barrel.
   A. Hirsch.
2. Bright Nickel.
   G. Soderberg, Technical Director, The Udylite Co., Detroit, Michigan.
3. Importance of Anode Corrosion in Nickel Plating.
   W. Pinner & E. Borchardt, General Spring & Bumper Co., Detroit, Michigan.
4. Investigations in Bright Zinc.
   New York Branch.

Tuesday Afternoon, June 14

12:00 M. Board Cars for Waukesha Beach—Picnic
Cars leave promptly on time at T.M.E.R.&L. Bldg., 2nd and Michigan Streets.

1:00 P. M. Dinner — Waukesha Beach Dining Room.

2:30 P. M. Ball Game, East vs. West.

5:30 P. M. Cars leave for Milwaukee.

Tuesday Evening, June 14

8:30 P. M. Educational Session.

1. 101 Questions and Answers on Copper Plating.
   Springfield Branch.
2. The Effect of Impurities on the Structure of Cyanide Copper Deposits.
   Walter Meyer, Electro-Chemist, General Electric Co., Bridgeport, Conn.
3. High Speed—High Temperature—Copper Plating Solutions.
   Floyd Oplinger, E. I. du Pont DeNemours, Wilmington, Del.
4. Rochelle Salts Copper Baths.
   Robert M. Wagner, Superintendent of Plating, Guide Lamp Div., General Motors Corp., Anderson, Ind.

Wednesday Morning, June 15

8:30 A. M. Plant Visitation.
Buses leave Hotel Schroeder promptly at 8:30.

1. National Plating Co., 325 N. 8th Street.
2. S. K. Williams Co., 2370 N. 32nd Street.
3. Cutler-Hammer, Inc., 13th & St. Paul Avenue.

Wednesday Afternoon, June 15

1:30 P. M. Educational Session.

1. Dips and Their Uses in the Plating Cycle.
   Hartford Branch.
2. Metal Coloring.
   G. Hogaboom, Hanson Van-Winkle Munning Co., Matawan, N. J.
3. Electro-Plating Solves Manufacturers Problems.
   Detroit Branch.
4. Effect of Carbonate and Sulfate on Cyanide Plating Solutions.
   R. O. Hull, Grasselli Chemical Company.

Wednesday Evening, June 15

8:00 P. M. Educational Session.

1. Wetting Agents in Plating Solutions.
   Newark Branch.
2. Industrial Finish Manufacture.
   E. Bucy, Zapon-Brevolite Div.,

Atlas Powder Co.

3. Use of Solvent Emulsions : Cleaning.
   Dr. Mitchell, Technical Director, Magnus Chemical C Garwood, N. J.
4. Fume Exhaust Design.
   Toronto Branch.
5. Paper.
   Philadelphia Branch.

Thursday Morning, June 16

8:00 A. M. Special Business Session.
To Discuss Constitutional Amendments.

Thursday Afternoon, June 16

1:30 P. M. Final Business Session.
Election of Officers.
Selection of Convention City.

Thursday Evening, June 16

6:30 P. M. Banquet and Dance.
Hotel Schroeder Ball Room.
Informal.
Entertainment. Fun for all.

"Triad Cleaners And Strippers". This is the title of a new bulletin which is now being distributed by Detroit Rex Products Company, 13017 Hillview Ave., Detroit, Michigan. Triad Cleaners and Strippers are available for all alkali cleaning requirements. These products are manufactured to remove oil, grease, dirt, polishing and buffing compounds, tempering materials, and baked enamels from metal products such as steel, iron, brass, copper and aluminum.

With the use of Triad Cleaners and Strippers metal can be prepared for plating, lacquering, painting, vitreous enameling, rust-proofing, heat treating, and pickling. They can be used in still tanks, washing machines, electric cleaning, wet grinding, paint spray booths and general cleaning operations. They can also be used to strip paint, lacquer, baked enamel, and electrodeposits from metal products preparatory to refinishing. In the bulletin "Triad Cleaners And Strippers", Detroit Rex Service is clearly explained. Detroit Rex field engineers, with years of metal cleaning experience and backed by the aggressive research of skilled laboratory technicians, make a study of the client's particular requirements, reveal the latest developments in cleaning technique, recommend means to improve quality and reduce cost, check strength of the cleaning solution with modern control equipment, train the client's operator in cleaning technique, and make available written recommendations and reports.

A copy of "Triad Cleaners And Strippers" will be sent free upon request.

"Dust Collecting Systems In Metal Industries". This is the title of an interesting 24-page catalog which is now being issued by The Kirk & Blum Mfg. Co., 2816 Spring Grove Ave., Cincinnati, Ohio. A great number of factories in which K & B Dust Collecting Systems have been installed are illustrated and described in this catalog.

The wide and thorough practical experience of the Kirk & Blum organization in designing dust control equipment for metal-working plants, which correctly meet the peculiar requirements of the materials worked, is demonstrated in the typical installations illustrated in this catalog. A reference to the classified list of installations shows many other plants with Kirk & Blum equipment which are not individually described in this catalog.

Such items as Kirk & Blum Economy Adjustable Hoods, Kirk & Blum One-Piece Elbows, and Kirk & Blum Streamlined Fittings are clearly explained and illustrated. Anyone contemplating the installation of a metal dust collecting system should have one of these catalogs. Copy free upon request.

"Metso 66 Folder". This is the title of a 6-page folder which is now being issued by Philadelphia Quartz Company, 125 S. Third St., Philadelphia, Pennsylvania. Metso 66 can be used for electrocleaning prior to the plating of steel, copper, nickel, chromium, brass and die castings. Six ounces of Metso 66 are recommended for each gallon of water. Metso 66 is a golden brown granulated compound which is easily and rapidly soluble. It is also said to rinse freely.

Recommendations for soaker tank cleaning, cleaning steel prior to enameling, and maintenance work are also described in this folder. Copy free upon request.

Mention PRODUCTS FINISHING when writing to advertisers. Your cooperation will be appreciated both by the advertiser and this magazine.

Polishing Die Cast Metals

FINISH is usually important where die cast parts are being polished, for in many cases they are subsequently plated. The special sizing methods used in preparing Alundum Abrasive give the uniformity that assures good finish—no oversize grains to scratch and mar. And of course, the special surface treatments given to Alundum Abrasive assure extra "sticking power"—a long lasting wheel head.

For "lowest cost per piece polished" it will pay you to use Alundum Abrasive.

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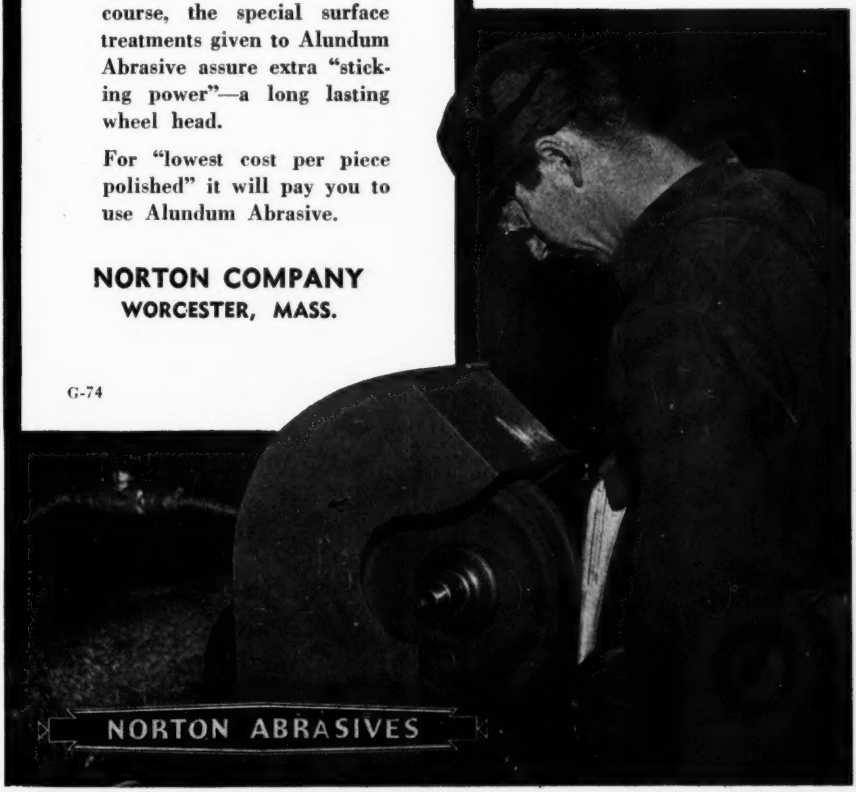


Efficient Plating Equipment Aids Merchandising

Production and Merchandising Schedule Maintained Through Use of Modern Methods.

By Fred W. Vogel

THE part that is played by modern manufacturing methods in placing modern accessories to living within the reach of the masses is clearly illustrated by the manner in which efficient equipment is employed in plants such as that described in this article. The plant under discussion here is that of a leading manufacturer of electric household appliances such as toasters, fans, grilles, and so on.

Appearance is important in the merchandising of household equipment, and inasmuch as the majority of such appliances are of metal construction, plating is a prime factor in this connection. A plate, properly applied, will also withstand the considerable abuse to which such appliances are usually subjected, and is of unusual value in the case of appliances which are intended to provide heat for one purpose or another.

Included in the plating equipment of the plant described herewith are two Stevens fully automatic plating machines of the newest design, two for the application of Harshaw XXX bright nickel and one Meaker for chrome. The two nickel machines are placed in parallel so that they can be fed from the same conveyor line.

The illustration Fig. 1 shows the racking of work for plating. Each one of the hundreds of thousands of parts that are plated in this plant during the course of a year's production must be placed on a rack of special design. These racks must be insulated against the corrosive action of the solu-

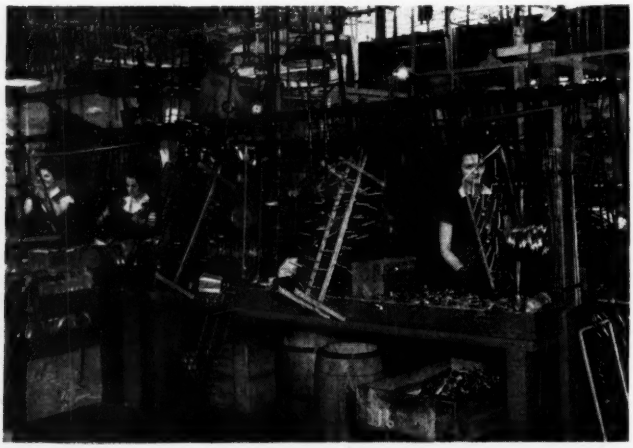


Fig. 1—This illustration shows a view of the racking department. All the racks used here are designed so as to eliminate pockets wherein water or plating solution could be trapped.

tions into which they are immersed and accordingly, are coated with an insulating material known as Korolac, used in combination with linen tape. The Korolac, which is a Goodrich Rubber Company product, is a synthetic solution into which the rack is dipped, then wound with linen tape, and finally dipped again. Baking hardens the Korolac and makes it impervious to the detrimental effects of acids.

As each rack is loaded with workpieces, it is hung at the edge of the degreaser platform shown in Fig. 2. Here one of the workmen can be seen removing the rack from the railing, while another is about to lower a rack into the degreasing tank. The tank is a "three-dip" degreaser comprising actually three tanks the first of which contains boiling Permaclore solvent, the second the cold solvent, and the third vaporized solvent. The boiling Permaclore removes the bulk

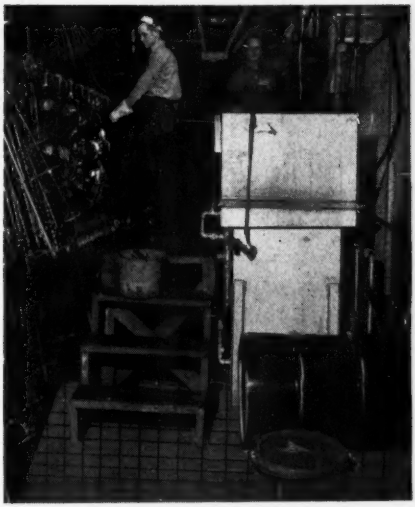


Fig. 2—The workmen shown in the illustration plunge the racked workpieces into the degreasing solution in the degreaser shown here.

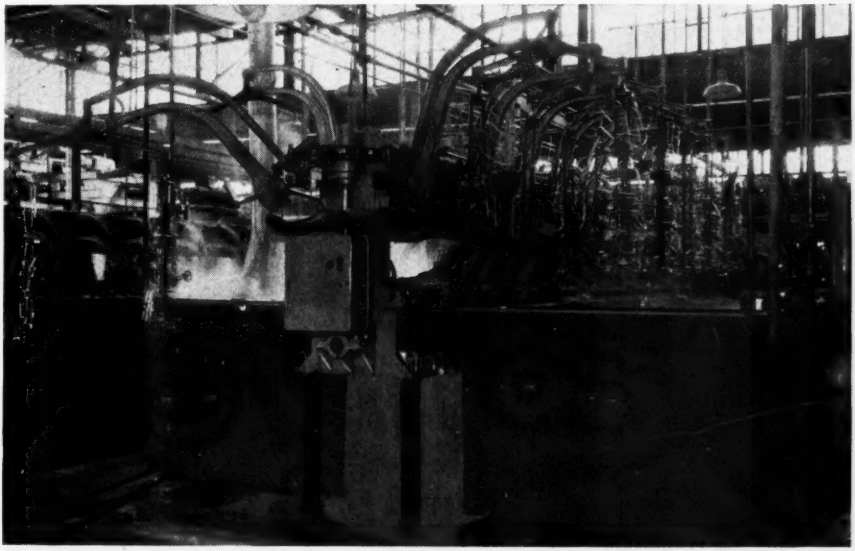


Fig. 3—The completely automatic bright nickel plating machine shown here is loaded at the left. The workpieces pass through the sequence of cleaning, rinsing, and plating baths and are unloaded from the conveyor at the right of the machine.

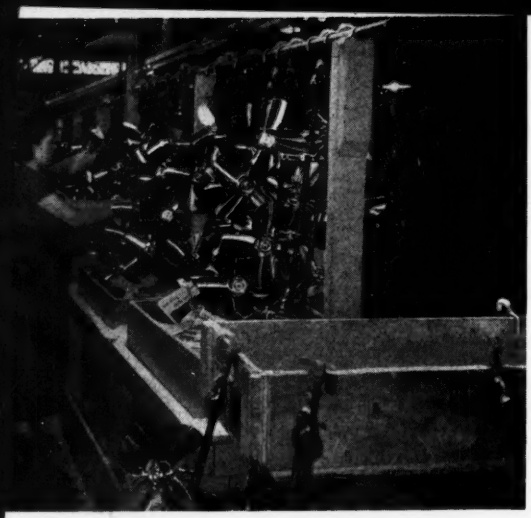


Fig. 4—The racks are removed from the arms of the bright nickel plating machine and hung over the bench shown herewith where the workpieces are taken from the racks and dried in sawdust.

of the drawing compound and cutting oils, the cold solvent chills the workpieces so that the solvent vapors will condense on them, and the vaporized solvent in the third tank condenses on the work and runs off, carrying the remainder of the oil, grease and dirt with it. Upon completion of the degreasing operation, the racks are hung on the overhead monorail conveyor which carries them to the loading end of the automatic plating machines.

The loading end of one of the two automatic bright nickel plating machines is shown in Fig. 3. The machine consists primarily of the series of tanks usually involved in the nickel plating cycle and a power-driven conveyor carrying a series of arms upon which the work-racks are hung. The tanks are arranged on a horseshoe-shaped plan, so that the workpieces can be loaded and unloaded at the same station. The arms are hinged and each arm carries a cam roller

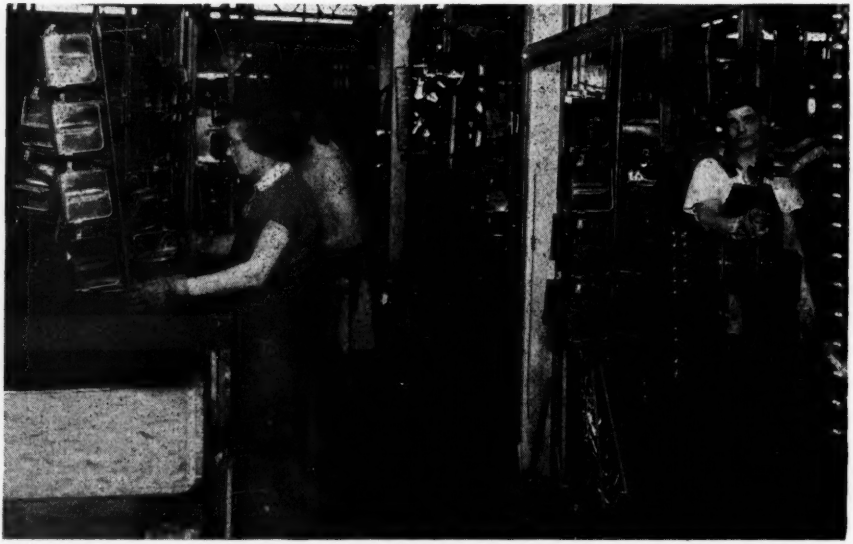


Fig. 5—The girl at the left is shown racking the nickel plated workpieces on racks for chromium plating. The man at the right is loading the racks onto the conveyor of the completely automatic chromium plating machine.

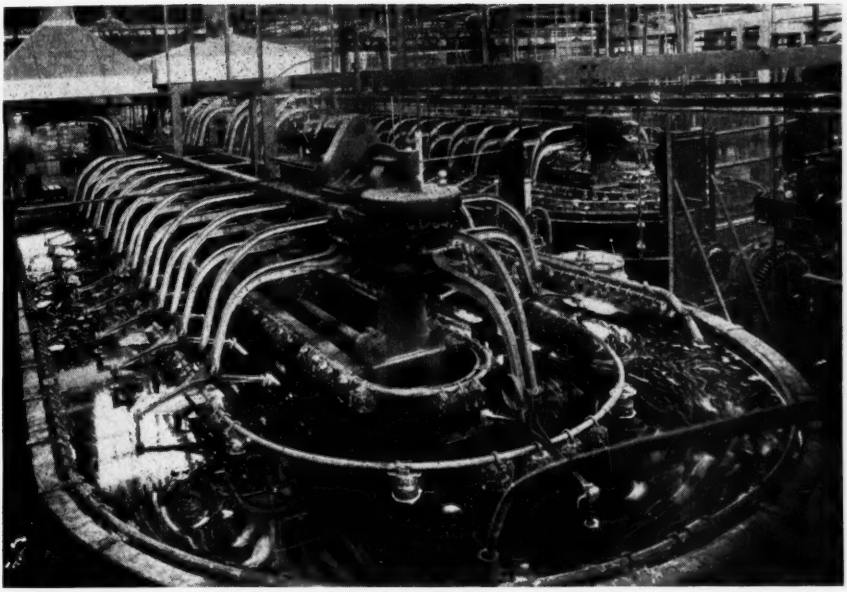


Fig. 6—General view of the plating department showing the chromium plating machine in the background. The tank in the foreground is a Triflex-lined steel tank used for Harshaw bright nickel plating service.

which rides on a continuous cam that is so designed that the arms are raised and lowered as required to dip the workpieces into the tanks in succession.

The first tank in the series contains hot alkali cleaner, into which the workpieces are immersed for 2½ minutes with reversed current. This cleaner removes the last vestige of grease and dirt, rendering the workpieces chemically clean and ready for the bright nickel plating bath.

The second tank is the cold water spray rinse, into which the workpieces are dipped and immediately removed.

The third tank is a 10 per cent muriatic acid dip into which the workpieces are plunged for a period of 56 seconds. This is followed by a cold water rinse.

The fourth tank is the bright nickel

Fig. 7—The workpieces are individually inspected as they pass along the conveyor by the workers shown in the illustration as they pass along a moving conveyor underneath the strong diffused light shown herewith.

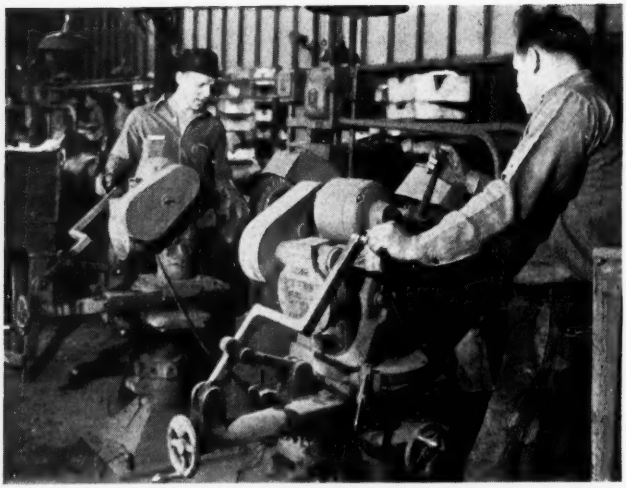


Fig. 8—Electric grille bases are quickly and economically finished on this Acme double polishing unit. Polishing is an essential operation in order to obtain a smooth base surface prior to the plating of such workpieces.

plating bath, containing Harshaw bright nickel solution. The workpieces are immersed in the bright nickel solution for a period of 20 minutes, more or less, depending upon the thickness of deposit desired. In this period of time a deposit of approximately 0.008 in. is obtained, using a current of 25 amperes per square foot at 6 volts. The pH of the solution is maintained at from 2.8 to 3.0. The bright nickel solution is kept free from accumulations of sludge and the work is kept free from dirt by the use of an Industrial continuous filter.

Upon leaving the bright nickel plating bath, the work is again spray-rinsed with cold water, following which it is dipped into a still cold water tank and then into another cold water bath. At this point the racks are removed from the arms of the plating machine and hung over the bench shown in Fig. 4, where the workpieces are taken from the racks and dried in sawdust.

The illustration Fig. 5 shows the workpieces again being racked for the chromium plating operation. As each rack is loaded it is hung on the rail shown at the right in the illustration from which it is removed by the chromium plating machine operator to be hung on one of the arms of the plating machine. This machine can be seen in the background of Fig. 6.

The current, however, is not reversed in this machine. The next tank is an activator tank, in which the current is reversed at the end of every 20-second period for a period of 4 seconds. The solution in this tank contains 10 ounces of sodium cyanide per gallon and 2 ounces of soda ash per gallon.

The capacity of the chromium plating tank is 2,000 gallons. The workpieces are immersed in this solution for 3 minutes at 150 amperes per square foot with 6 volts. Upon leaving the bath the workpieces are subjected to a cold water rinse and are then ready for drying in sawdust again. As the pieces are dried they are placed on a belt conveyor which carries them past an inspector who examines each piece under a strong diffused light. From this point they are conveyed to the assembling department.

Mention PRODUCTS FINISHING when writing to advertisers. Your cooperation will be appreciated both by the advertiser and this magazine.

EGYPTIAN CLEAR LACQUERS

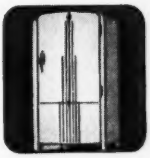
The Egyptian Line of Clear Lacquers is indeed an extensive one. There are clear lacquers for a variety of uses on all types of metals as well as for wood, paper, leather, fiber, glass and a host of other industrial products.

Egyptian Clear Lacquers are formulated for use by spray, dip, and brush application . . . They are furnished in gloss, semi-gloss, and matt finishes . . . There are also Egyptian Clear Lacquers which are extensively used as finishing coats over colored enamels and as Bronze Mediums for use in conjunction with Bronze Powders.

Whatever your requirements may be for the use of clear lacquers, you will find an Egyptian Lacquer for the purpose.

In addition to clear lacquers, we also market a line of pigmented lacquer enamels, synthetic finishes in colors and clears, colored transparent lacquers and many novelty finishes. Our line of industrial finishes also includes all types of undercoats, thinners, reducers, etc.

We will be glad to furnish manufacturers of industrial products with complete information regarding Egyptian Finishes.



The Egyptian Lacquer Mfg. Co.
Rockefeller Center, New York, N. Y.

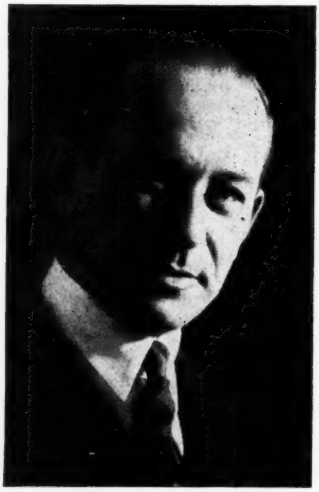
EGYPTIAN FINISHES

Barrel Finishing of Metal Products

Further Factors in the Selection and Use of Metallic Burnishing Materials, with Illustrations of the Best Accepted Forms.

By H. Leroy Beaver

IN the April 1937 issue of Products Finishing we submitted a paper accompanied with brief illustrations and descriptions of various forms of steel burnishing materials, but it has been suggested and the criticism has been made that the paper was not sufficiently complete and that the illustrations certainly were inadequate to picture in the mind's eye of the reader just what the various forms should be. Now inasmuch as the Annual Convention of the American Electroplaters Society will be held this month and as there will be several thousands of additional copies of Products Finishing for distribution, this would be an opportune time for a further discussion of the subject.



H. Leroy Beaver

To those readers familiar with burnishing materials and who have used some one or more of the various forms, the previous illustrations were such that they could be readily recognized, but we frankly admit that to the uninitiated or to those not familiar with barrel burnishing materials or practice, the previous illustrations left a very great deal to be desired. So now, in order that every reader of Products Finishing might become entirely familiar with the complete range of steel burnishing materials we have prepared a list of eleven individual pieces and two groups, which we believe to be the finest exposition of the subject by way of pictured illustration ever issued. Photography alone could not adequately portray the high lights of the various pieces and it was necessary to photograph, enlarge, block out, rephotograph, and then the services of a prominent commercial artist was enlisted in order that we might adequately portray to the reader an acceptible illustration, description and history of the various forms and their application to barrel finishing practice.

First then we would like to illustrate the ordinary round steel bur-

nishing ball that is used in commercial practice. Illustration Fig. 1 shows one of the commercial type.

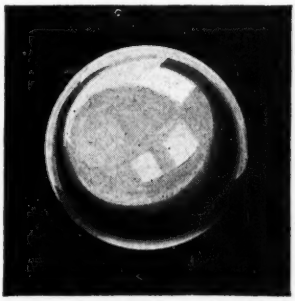


Fig. 1—Burnishing Ball

In a previous paper we detailed the first use of steel balls, they being reject bearing balls and first used by Edmunds in England about 1902. The use of rejected bearing balls then continued as the only materials available up to about the year 1910 a period of eight years and it was about this time that George E. Abbott perfected his high and narrow type burnishing barrel. The fact that this barrel immediately met with favor naturally created an increased demand for balls and not sufficient reject balls were available to supply the demand. Obviously, barrel sales were impossible unless burnishing materials could be supplied to operate them, and it was this that prompted Mr. Abbott, twenty eight years ago, to begin the production of steel burnishing balls. Down through all of these years Mr. Abbott and the writer of this series were close personal friends, and we know much of the grief attending the first years of developing a ball more adequate and better fitted for burnishing work than rejected bearing balls. In the beginning Mr. Abbott had associated with him Mr. John Brice and later Charles Koehler followed by Mr. Jay Pinckney, and to the vast amount of experimental work done by this group of men down through the formative years we owe much of the success of the present day steel burnishing materials, conceded to be the finest in the whole world. The mere forming of the rough blanks from which burnishing balls are made is of course the simplest part of the procedure. It is in the succeeding operations of cutting down, hardening and finishing where the greatest pains must be taken in order that the finished product will be entirely adequate for the work. The ground work for all of this procedure having been directed by Mr. Abbott, now deceased, his work is being carried on by his son, G. K. Abbott, and we believe it would be conceded that the burnish materials produced by his organization are the finest obtainable.

Before proceeding further we would wish to present one apt and easily understood illustration of what we mean when we speak of the inadequacy of round balls for general or what we might term all-purpose burnishing. We first illustrate the capital letter L and then a small or lower case o. In the letter L we have a definite angle such as may be found

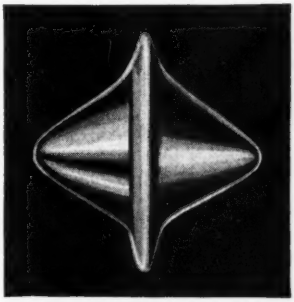


Fig. 2—Burnishing Cone

on a large majority, especially of stampings, that are barrel burnished. The small letter o definitely repre-

sents a curved arc. The problem for those operators of barrels who consistently refuse to use materials other than round balls is to attempt an explanation of just how the round ball may be made to burnish into the angle. Of course it cannot be done and that is why formed burnishing pieces are rapidly supplanting round balls in general burnishing practice.

While successively down through the years George E. Abbott recognized the inadequacy of round balls for many burnishing operations and particularly where there were angles and grooves where a curved surface could not reach, it was not until about 1918 that he started production on a double conical piece which he called a burnishing cone and which we here illustrate in Fig. 2.

His conception of the cone followed a trip he had made to England where he had met one Wenger who, for his own use in his own business was producing a conical form by turning them from ¼" tool steel drill rod, but each time he turned one cone he lost enough material to produce a second one and the operation was both slow and expensive. Mr. Abbott first attempted to form a single cone by

Fig. 3—Burnishing Peb

heading, but the pressure necessary to force the steel deep into the conical die was such that a flange was pressed on the base, and the finished part resembled somewhat a large nail head with a conical form projecting,

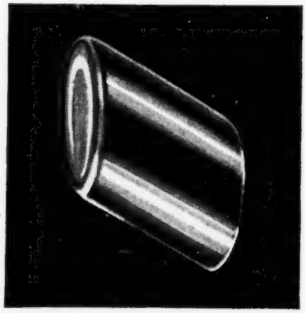


Fig. 4—Diagonal

and made an awkward and unsightly piece. He then conceived the idea of pressing a conical section on two sides of a piece and the projecting flange set up at the equator was controlled in such a way that it could be made available as a part of the burnishing piece.

The average user of formed burnishing materials probably has little conception of the vast amount of experimental work that was involved in perfecting these formed burnishing pieces. As with balls the first forming is not such a difficult matter, even though it too has its moments. It is in the heat treating that the greatest care and knowledge is required. There must be a definite and very close relation of the area of the projecting flanges as relates to the whole piece, and if this is not known and closely observed then difficulty arises in the heat treating processes whereby the flanges may become too brittle and show failure in operation. (This does not however refer to failure of flanges from improper operation of the materials). Any burnishing material may be **properly used** and any burnishing material may also be **improperly**

abused.

Following this there was no further development of new burnishing materials until 1923. Prior to this the writer of this series had begun his own research work to determine further suitable forms to perform given operations in barrel finishing. The first development was of a part called a "peb," and which was so named due to the fact that in appearance it resembled nothing so much as a pebble in that the parts were irregularly shaped and with a plurality of curved surfaces. One is shown in Fig. 3.

The thought of incorporating more than one curve combined with straight sides, flats and points was made the subject of an application for United States Patent and following the orderly procedure there was issued from the United States Patent Office on April 24th, 1923, U. S. Patent No. 1453120, the principal claim in said patent cover being:

"A metal polishing material comprising hetermorphic asymetrical polished steel units, a portion of which have projections adapted to make polishing contact with the angular surfaces of the metal part to be polished whereby the various irregular shapes and coutours of the units will make polishing contact with the angular surfaces of the parts to be polished."

This constitutes the first record of the issuance of a patent covering burnishing materials other than round balls or oval forms. The previous double cone and the various forms of polishing pins were not subject to patent procedure having been previously dedicated to public use by the lapse of time.

The first form that was perfected under these claims was a steel drop shot formed by exploding a column of molten metal by means of a jet of live steam. The violent disintegration

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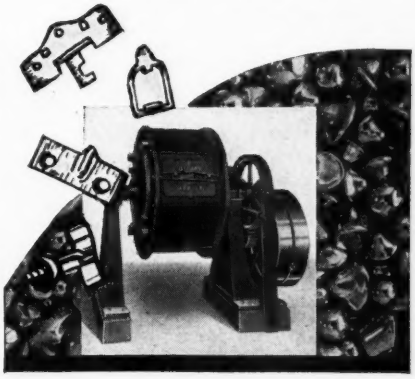

ABBOTT
BALL BURNISHING

of the molten metal causing it to be thrown into the air in a cupola formed structure, and in falling it formed

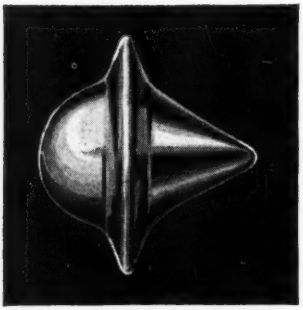

Fig. 5—Balcone

into globules not regular in form but much resembling rain drops or pebbles, but however the form might be regarded the name "PEBS" was given to it in abbreviation of the word "pebble" this seeming adequate and hundreds of tons of these forms ranging in size from $\frac{1}{16}$ in. to ¼ in. in size are in regular use in manufacturing plants all over the country. As indicative of the type of companies using Pebs we might mention the work of the well known Columbia Mills, Inc., with plants at Minetto, N. Y., and Saginaw, Mich., who have regularly used a great many tons of them in the burnishing operations on their drapery hardware parts.

In burnishing hardened parts with Vienna Lime, as described in the April 1938 issue of Products Finishing, it is desirable to use some cushioning medium and it is here that the parts known as Pebs are especially applicable because they are the most reasonable in price of any burnishing materials, and in the course of manufacture they too are lime finished. Naturally the cushioning burnishing material will be worn down in exactly the same proportion as the amount of surface removed from the parts being finished. Generally this will average from .00015 in. to .0002 in. on each load of material, and wherever possible we would suggest starting with size $\frac{3}{16}$ in. Pebs and they will function satisfactorily until they are reduced in size to $\frac{1}{16}$ in. or smaller. Pebs are hardened clear through while regular burnishing balls or forms are of the case hardened variety, so in Pebs there is no casing to wear through, but it is principally in their lower cost and the latter fact of their being hardened clear through that makes them especially applicable to the finishing or burnishing of hardened steel parts by the Vienna Lime Process.

The next in the line of development came in March, 1927, and was termed a "Diagonal" as here illustrated and which takes its name from the fact that it is a round section of steel out at an angle of 45 deg. which gives us a diagonally shaped piece as shown in Fig. 4.

Examination of the illustration discloses that in addition to the round body of the piece itself it also has two projecting points and two flat surfaces so that in this one form we

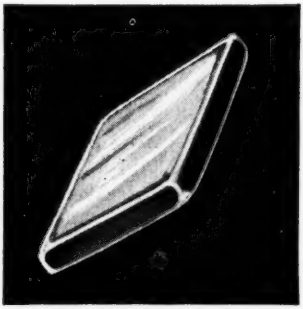

Fig. 6—Diamonstel

really have a combination of the effect to be secured from a round ball, a pin and a disc as all of these surfaces

are represented. Diagonals may be used alone or in conjunction with balls or other forms. In the plant of the Carey-McFall Company in Philadelphia, their barrel burnishing work, under the direction of Mr. Albert Hirsch, a widely known authority on metal finishing, was done with diagonals exclusively and ranks with the very finest efforts in barrel finishing.

Next in line of development was in July, 1927, when another burnishing form composed of one half of a round ball and a full cone joined by a connecting fin gave us a natural half-and-half combination of ball and cone and the piece was called a Balcone indicative of its particular form as here illustrated in Fig. 5.

When George E. Abbott first developed the double pointed cone shaped piece bisected by a flange, he felt that these forms, when used alone, might be too harsh and that when so used would set up too great a resistance to the parts passing through the mass. For this reason he almost invariably advocated that they be used with an equal quantity of round balls to ease the pressure on the parts. In many applications, his position was properly taken, and what we sought to do was to develop in one piece a combination of a ball and cone which could be used indiscriminately on all classes of work. This combination in actual work proved to be a happy one and Balcones enjoy a wide favor in the metal finishing trades. An outstanding example might be cited in the American Safety Razor Company of Brooklyn, N. Y., where Balcones are used exclusively in all of the barrel finishing operations on the nationally known Gem Razors. The widely known line of high quality electrical products of The Proctor Electric Company of Philadelphia present another outstanding example of quality products

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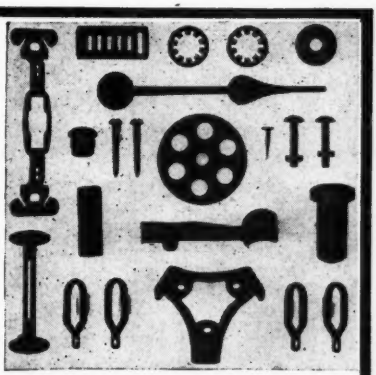

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The next in line of development was in September of 1927, when a diamond or lozenge shaped steel form as illustrated in Fig. 6 was perfected.

The piece was named a Diamonstel due to its general shape being that of a conventional geometrical diamond. The formation of this piece is by carefully bright rolling round stock to the necessary width after which it is also cut off at an angle of 45 deg. across the flat. This gives us a piece that has two round edges and two square edges and with two points tapering to 1/32 in. and two blunt angles rather obtuse in form. Due to the character of the material and the method of rolling, the flat faces of these forms are depended upon when under pressure in the burnishing mass to present a very wide burnishing surface and they are particularly applicable for burnishing flat surfaces as well as angles and grooves that cannot be reached with round balls. Another feature is their facility in burnishing the edges of holes in parts especially on brass and other nonferrous metals. The brass cages which carry the steel balls in the precision

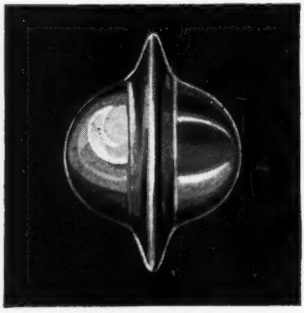

Fig. 7—Finbal

ball bearings manufactured by the Norma-Hoffmann Bearings Corporation, Stamford, Conn., are an example of barrel burnishing work accomplished with Diamonstels. The ball apertures in these cages are

Fig. 8—Disc

drilled, and in barrel burnishing the cages it was found that the diamond shaped forms had a special facility for not only clearing off the burrs left by the drill bit but also of smoothly burnishing the faces of the drilled holes.

Next in line of development was in November of 1927 when the Finbal was first introduced in the metal finishing field. This piece is composed of two halves of a ball bisected by a fin projecting $\frac{1}{16}$ in. over the normal ball diameter at the equator of the piece, as illustrated in Fig. 7.

In many parts regularly barrel burnished we encounter parts with what are sometimes termed "blind holes," that is, drilled holes that do not go entirely through the piece, and especially is this true of castings. Burnishing balls are not held to a high degree of accuracy the reason for this being to prevent their use in ball bearings for which their own special method of heat treating renders them unsatisfactory. The average in a given size, will run considerably both over size and undersize, and to overcome the ""plugging" of such "blind holes," by off size balls, the

fin was placed about the equator of the ball. This has served the two-fold purpose of preventing the burnishing material from plugging the holes and in addition to this the projecting fin enables the operator to reach into and burnish angles and grooves smaller than the normal ball diameter with his barrel burnishing equipment that he could not otherwise hope to do.

Between the development of the Diamonstel and Finbal the burnishing Disc was first introduced, as illustrated in Fig. 8.

This piece is simply a disc of steel ¼ in. in diameter and $\frac{1}{16}$ in. thick. They are stamped from cold rolled stock, cut down until smooth, then hardened and polished by a process identical to that described in the April issue of Products Finishing. The problem in which they were originally used developed with the Magazine Repeating Razor Company of Sound Beach, Conn., where they were used to remove the burrs and burnish the comb plates on safety razors. Since that time they have enjoyed a wide application. They are never used alone but mixed with other burnishing materials but not to exceed 30 per cent of the complete burnishing mass.

Burnishing Pins were first introduced in the United States with the advent of silver burnishing in the hotel, restaurant and institutional field.

The first pins were manufactured in what is now the Fletcher Works in Philadelphia where Tahara Automatic Silver Burnishing Machines were first produced in the United States. These pins were simply ½ in. sections cut from steel piano wire of $\frac{1}{16}$ in. diameter. After cutting the pins were operated in oil and emery to round up the ends after which they were polished and added to the round balls in the proportion of 16 per cent. We do not now, nor have we ever held burnishing pins in very high re-

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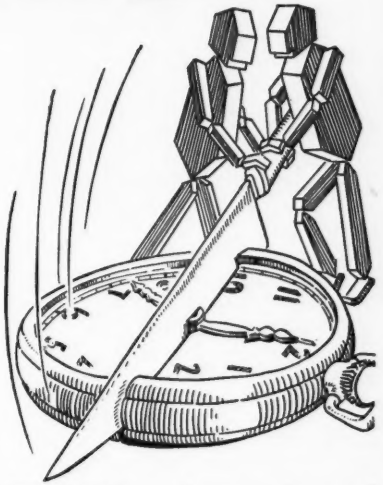

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gard as a burnishing medium. Originally the theory was advanced that inasmuch as many parts to be barrel

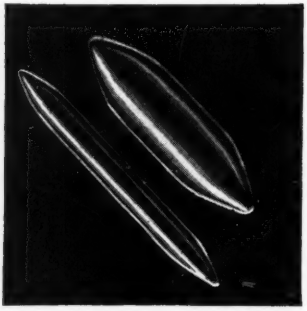

Fig. 9—Burnishing Pins

finished were ornamental in character that these taper pins would stand on end and thus burnish into and around the ornamental parts. This, of course, was true in theory only but definitely not true in practice. A burnishing pin is a purely inanimate object and by no stretch of the imagination can we assume that it will do anything even approximating the claims made for it. In all of our research work we cannot conclude that a burnishing pin will do more than a round ball with a diameter equivalent to the diameter of the shank of the pin. These pins being far lighter than any balls or other burnishing forms used with them have a tendency to float on top of the burnishing mass. Where they are used in burnishing barrels where one-third of the barrel area composes the lid, the soap solution surges over the side of the barrel immediately the lid is raised, and even in a normal soap solution lather these pins will be carried over the side of the barrel and lost down the drain. As an illustration of this we may cite a series of tests we made several years ago on a barrel of the last above described variety and after having been in use for four weeks, the proportion of pins in the mass had dropped from the original load of 20 pounds to only 11 pounds, and as pins generally sell for as much as 60 cents per pound a loss of 9 pounds indicates a loss of $5.40 in material cost alone.

A period of ten years now passes with no new development on metallic burnishing materials until April, 1937, when a new form was developed that in its action, when operated in the average conventional barrel, would closely approximate the action that would be secured in a barrel of the oscillating type but without the deforming tendency usually accompanying the operation in oscillating barrels. We accomplish this by the use of a form that would closely resemble a ball with both poles down to a dull point thus forming an oval not unlike a football in appearance, as illustrated.

An oscillating barrel has a tendency to slide the work from one end of the barrel to the other all while the mass is in revolution and, of course, provides far greater break-up of the mass than would be had with the conventional type of barrel. We

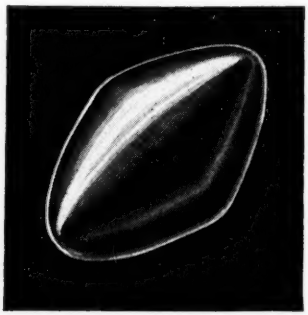

Fig. 10—Ovalbal

have never subscribed to the oscillating type of barrel because we have seen too many cases where they have

proved to be impractical. Only a few weeks ago a research engineer appearing before one of the branches of the American Electroplaters' Society said, among other things, that it had become necessary for them to insert rubber pads in their oscillating barrel ends to prevent peening of the parts in operation due to their striking the ends of the barrel in the surge of the mass from one end of the barrel to the other. We may with Ovalbals fully approximate everything that can be done in an oscillating type of barrel by way of burnishing and without the usual deformation that so often arises in the operation of barrels of this type.

The next and only other development for 1937 is a form approximating a cube resembling very much a metallic dice and having the six flat sides and slightly rounded edges and corners. They are intended to give the maximum of flat surface area contact and are applicable especially and particularly for burnishing flat pieces where, under pressure, they provide a

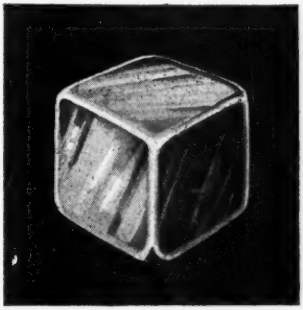

Fig. 11—Cubal

band or line of contact that no other form could supply in the same degree. This form is as here illustrated and it derives its name from the fact that it is a cube in form but is used in

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the same manner as a ball, in burnishing work. The development work on this piece has not been entirely completed and there remains some additional research before the full possibilities of this particular form is realized. It does however show promise of developing into a most efficient auxiliary to round out a complete line of formed burnishing materials.

Now it is not alone in their ability to reach into and completely burnish angles and grooves as well as intricate spots in general pressed or formed metal designs that formed burnishing pieces excel, for in addition to this they have other and equally important features. Let us suppose that we have a long and narrow type of burnishing barrel which we are operating with balls only as a burnishing pressure medium. The balls can only make a contact against the part to be burnished equivalent to the point of a needle and hence exactly the same type of contact against each other. It is due to this very fine point of contact that round balls have proven so efficient for use in radial and thrust ball bearings because they offer the least resistance

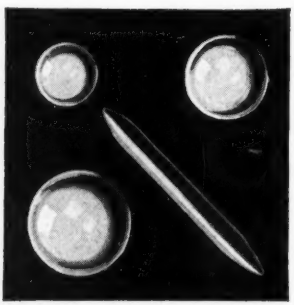

Fig. 12—Ball and Pin Mixture

of any known body. This lack of resistance requires a longer time to sesure a burnished finish and so if we should substitute formed burnishing pieces for round balls we then have not only broader and different contacts

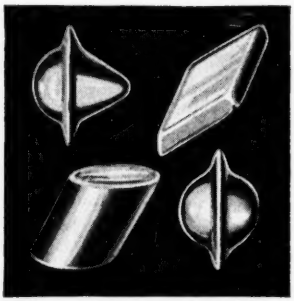

Fig. 13—Superior (Burnishing) Mixture

but an interlocking tendency that could not be secured with balls, and which, of course, sets up a greater resistance thus bringing the long and narrow barrel closer to the operating efficiency of the high and narrow type. If the reader will examine and compare the two illustrations herewith we believe he will be readily able to visualize exactly the meaning we are seeking to convey. The first illustration represents the conventional mixture of ⅛ in., 5/32 in. and $\frac{3}{16}$ in. round balls and $\frac{1}{16}$ in. by ½ in. taper steel burnishing pins, as shown in Fig. 12, and the second represents a mixture formed from Balcones, Diamonstels, Diagonals and Finbals, as shown in Fig. 13.

Now if we were to press the balls against the pin we would have only needle point contacts, but if we were to press the formed pieces together so that they formed contact with each other we would then note how completely we have secured the interlocking we have previously described and it must be quite obvious that parts passing through the latter mass will meet with far greater resistance and provide faster and more complete burnishing action.

The text of this paper is naturally supplemental to and should be considered in connection with the previous paper appearing in the April, 1937, issue of Products Finishing which was entitled "Factors in the Selection of Metallic Burnishing Materials," to which the reader is again referred.

Should any of the readers of this series desire actual samples of the various burnishing materials illustrated and described in this paper he may receive them, without obligation, of course, by addressing a card or letter to H. Leroy Beaver, Lansdale, Pa.

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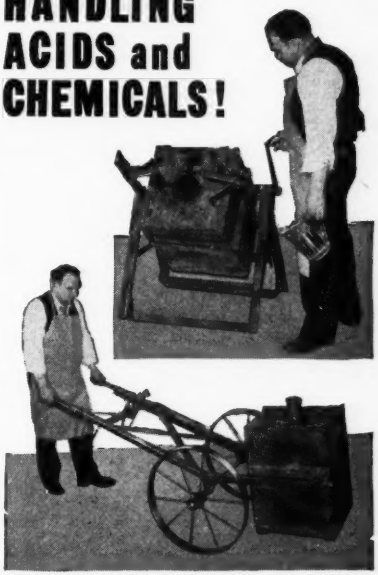

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Sherardizing Process for Rust Proofing

By F. F. Schoen

Vice-President, The National Sherardizing & Machine Co., Hartford, Conn.

SHERARDIZING, or dry galvanizing, is a process whereby articles of iron and steel can be rendered rust proof by the application of a coating of zinc dust. The process consists essentially of tumbling the workpieces in a drum containing zinc dust, however, in some cases the process can be carried out effectively by merely placing the workpieces into zinc dust and applying heat. The coating produced by this process can very aptly be referred to as an alloy for the reason that the zinc dust forms an alloy with the underlying metal. After the alloying action between the zinc and the base metal is completed by means of the tumbling action or the application of heat, an outer layer of zinc is deposited. The zinc penetrates into every crevice and cavity and the coating thus applied is not a pure layer of zinc, but a zinc-iron alloy.

Since the process of Sherardizing is being carried on in many plants under different conditions, it is almost impossible to give a set of specific rules for Sherardizing. However, the suggestions contained in the following article can be applied in general to all plants using the process.

The process of Sherardizing can be divided into the following steps or stages, each of which has a definite relation to the completed job:

1. Inspection
2. Equipment
3. Zinc Dust
4. Cleaning or Preparing of Surface
5. Temperature or Time.

In the same manner as in electrogalvanizing and hot galvanizing, the surface of the articles must be thoroughly cleaned before being subjected to the Sherardizing process. When the workpiece to be Sherardized is to be subjected to sharp bending or considerable variations of temperature, the thickness of coating will be limited, since zinc, being more brittle and having a different coefficient than iron, will separate from the iron under extreme variations of temperature if too thick a coating is applied.

The method, whereby articles to be treated are placed in zinc dust, is used in the case where large pieces, plates and sheets are to be treated. In such cases, if the transmission of heat through the zinc dust were perfect and if the deterioration of the zinc articles were negligible, motion of the articles during treatment would be unnecessary. Such, however, is not the case, for zinc dust is a poor conductor of heat and the deterioration of the zinc particles in intimate contact with the article treated requires a continuous replacement of new particles. Since this process continues during the cooling period, until it reaches its critical point, where it ceases, tumbling will produce the same effect then as during the heating period.

It is an established fact that in

Sherardizing the presence of zinc oxide is necessary. It might be supposed, therefore, that a molecule of oxide is reduced to voltaic action when it comes into contact with the iron. The zinc attaches itself to the iron, which acts as a cathode in electrolysis, and the oxygen travels in the opposite direction, combines with a free molecule of zinc to form a molecule of oxide, and goes through the same performance as before.

Zinc dust appears to break down into a vapor at about 150 to 200 deg. C., although it undoubtedly begins to disintegrate at a lower heat. As the pressure increases, the zinc dust requires a greater amount of heat to cause the breakdown. As the vapor condenses, the pressure is relieved and the hot particles of dust are vaporized and reestablished in equilibrium.

In a gaseous state, the zinc vapor can force itself into the pores of the metal and form a deposit to a depth which will increase with the duration of the treatment.

Rapid cooling will cause the zinc to condense as crystals, the adherence of which to the iron is inversely proportional to their size. Normal cooling yields a fine, glossy surface of what can be appropriately termed ferrozinc.

By buffing the Sherardized surface on a fine polishing wheel and afterwards placing it on a cloth wheel for color, a finish can be obtained which is more brilliant than nickel plating, compares very favorably with silver plating in color, and will not tarnish. The Sherardized article is a fraction

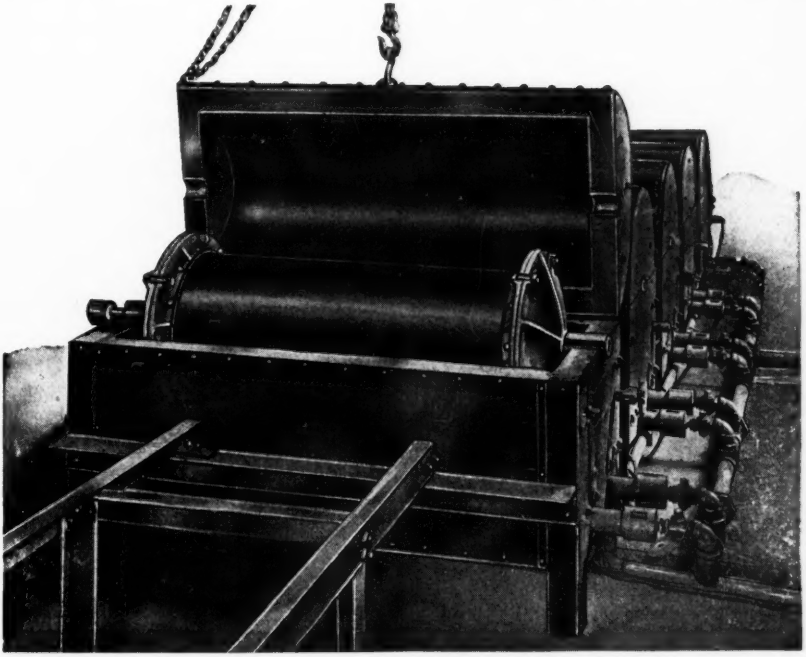

Fig. 1—This is an illustration of an oval shaped portable gas burning furnace of the type used in the Sherardizing process. Furnaces of this type are available with or without automatic rotating drive.

dark and velvety in appearance due to the zinc coating. When cutting down for this finish the general impression is that all the zinc is being ground off and relieved from the surface. This is not the case, due to the zinc alloy which is formed, and if a piece of Sherardized work is closely inspected a fine zinc coating will show, and perfect rust protection remains as long as this veining is visible to the naked eye. In addition, the friction from a wheel caused in burnishing the surface has a tendency to increase the crystal hardness of the coating so that it further resists weather action.

By taking a piece of cold rolled steel and Sherardizing it to a thickness of .001½ in. and passing it through the rolls cold and breaking it down twice its length, it will still show the same resistance against copper sulphate tests as before the reduction was made. This test proves that the more friction that is brought to bear, as previously stated, the more resistance against corrosion. It has also been found that material can be top finished in nickel, brass, copper and bronze, and also can be readily japanned, enameled and painted.

In the case of copper and bronze, after plating the material should be set aside for forty-eight to seventy-two hours, for action to take place between zinc and copper or bronze. This action makes the surface appear very dark and after the action ceases, the work can then be placed on a buffing wheel for coloring and no further action takes place. In the case of a japanned coating, it is recommended that the first dip be made in a solution of about 50 per cent ben-

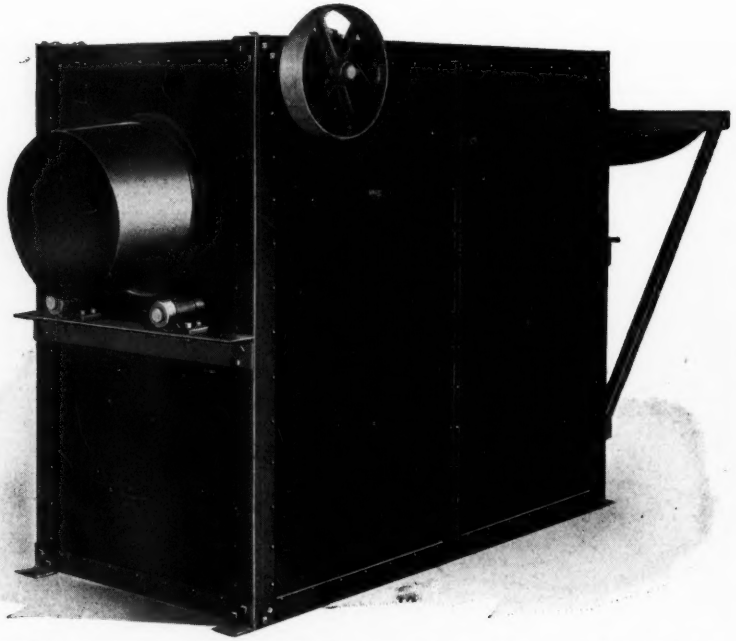

Fig. 2—Screening machine used for separating zinc dust from work. The zinc dust falls to the bottom chamber of the unit while the work remains in the perforated cylinder.

zine and 50 per cent japan. This thin coating insures a perfect body. This can be baked on very hard and the second dip can be a heavier coating.

"Simple Methods of Analyzing Plating Solutions; 4th Edition, 1938." This is the title of a catalog which is now being published by Hanson-Van Winkle-Munning Co., Matawan, New Jersey. In this catalog is destroyed the methods used in commercial practice of analyzing plating solutions of all important commercial metals, including nickel, brass, cadmium, copper, chromium, gold, silver, tin and zinc, for all of the important constituents.

The outstanding feature of the descriptive matter in the catalog is that the methods described, while technically correct for commercial control of solutions, do not require a trained chemist to operate them. Chemical analysis can be made by any plater with an ordinary education, who can learn in a short time to control solutions. Since all the methods of analysis are volumetric, no analytical balances or complicated mathematical computations are required. The factors of each standard solution are printed on the label. This 4th Edition includes a number of useful charts and tables. Copy free upon request.

Electrotinning with the du Pont Sodium Stannate-Acetate Bath is the title of the catalog now being issued by E. I. du Pont de Nemours & Company, Inc., Electroplating Division, Wilmington, Delaware. This catalog gives recommended practice for the operation of the du Pont Sodium Stannate-Acetate Electrotinning process. It also presents standard methods of preparing, controlling and analyzing the solution. The information in this catalog is of general nature and may be readily understood by those interested in the process.

The information contained in this catalog is divided into five sections as follows: Practical Value of du Pont Sodium Stannate-Acetate Electrotinning, Plating Solutions—Materials, Control and Maintenance, Preparation of Base Metal, and Bath Control—Analytical Methods. The material on each subject is written in a concise, understandable manner.

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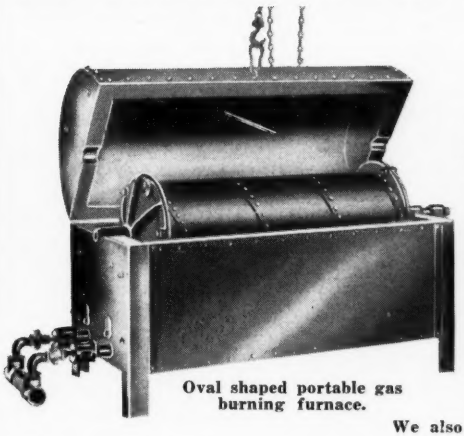

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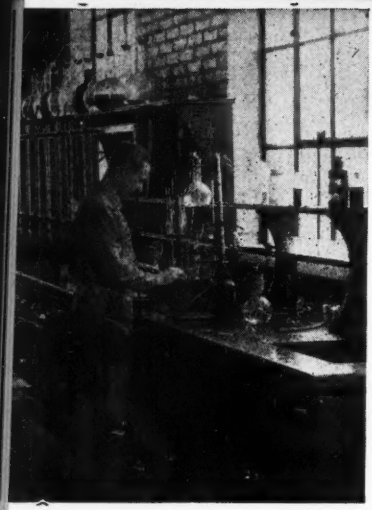

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Manual of Electroplating Solution Analysis and Control

By E. A. Blount

THE routine analysis and control of all types of electroplating solutions has in recent years become quite common practice, and considerable work has been performed and recorded regarding various analytical methods. However, there seems to be a lack of coordination in the collection and assembly of pertinent information relating to solution analysis and control. It is the purpose of this manual to assemble into one concise summary the various methods of analyzing plating solutions, the various solutions and special test equipment used for the purpose, and what is most important, the standards or optimum values for the solution components.

Plating solution analysis, in general, can be as complicated or simple as the chemist or plater cares to make it. However, if the analysis is made with the thought of control foremost, it should be as simple as possible without a sacrifice of too much accuracy. A system of control analysis, such as this manual attempts to present, involves the determination of the "control variables" or various components of any solution, and the recommendation of certain standards for these variables under different shop conditions.

All routine analysis or tests on plating solutions can be divided into two general classes. There are the strictly "chemical" analytical methods, and other methods involving chemical principles, but more mechanical and practical in their application. It shall be the purpose of this manual to present outstanding examples of each type of analysis and leave to the discretion of the individual plater or control man the selection of the exact method to be employed in each case. If the plater has chemical laboratory facilities, he may find it more economical and satisfactory to employ strictly chemical methods of analysis. If he has no laboratory facilities, he may wish to equip a simple laboratory and employ simpler methods of analysis wherever possible. In any case, all the solutions used and their preparation, will be discussed fully, so that the plater may make up his own testing solutions if he has the necessary laboratory equipment.

If he so wishes, he will be able to order solutions from any chemical supply house or platers' supply house, specifying the concentration of each solution. In short, this manual attempts not to limit the use of its information to any one group. The chemical analysis will be presented in detail so that any one with chemical training can follow it easily. The various commercially distributed test sets for making the more practical tests will be discussed also and sources for the necessary equipment listed. It is neither meant nor implied that chemical analysis is more accurate than the simpler tests in every case. There are advantages to each, and the selection of the method to be used will depend on the local shop conditions in most cases. Of course, there are tests that can be made only by strictly chemical methods, but in most cases there is a choice of methods possible. The commercial test set methods will not be discussed in detail, since complete directions are furnished with the set, but the type of each test method will be described.

Method of Taking a Sample

The first step in any system of analysis is to be sure to take a representative sample of the solution or material to be tested. Sometimes solutions will not have the same strength at the surface that is shown at other points. A representative sample of a solution may be obtained by dipping a 24-inch glass tube, ¼ inch in diameter, into the solution in about six different areas in the tank and collecting the total sample in a clean, dry, glass container. The size of the total sample will depend on the type of test to be used and the amount of solution needed for the test. In any case, a sample totalling two or three ounces should be taken in the manner described above.

Alkaline Cleaning Solutions

A. Determination of Cleaner Strength as Sodium Hydroxide.
   1. Pipette a 10 cc. sample of cleaning solution into a 250 cc. flask.
   2. Add 100 cc. distilled water.
   3. Add 1 drop of phenolphthalein indicator.
   4. Titrate the sample with 1.87 normal acid (hydrochloric or sulphuric) until the purple color fades to colorless.
   5. Record cc. of acid used.
   6. Add 3 drops of methyl orange indicator.
   7. Continue titration until straw color changes to pink.
   8. Record total cc. of acid used.
   9. Cc. acid used in (5) equals cleaner strength in ounces per gallon of sodium hydroxide (caustic soda).

B. Determination of Available Alkalinity.
   1. Cc. of acid used in (A-5) divided by total cc. of acid used

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(A-8) equals the available alkalinity. The available alka linity is the ratio of the active portion of the cleaner to the total amount of cleaning material present.

C. Determination of Cleaner Strength with Kocour Cleaner Test Set.
   1. The method used in this set is essentially the same as that in (A) above, but the testing procedure has been worked out in a somewhat simpler manner.

D. Determination of Cleaner Strength as pH.
   1. With pH papers. Dip paper in cleaner and read directly.
   2. With color comparator set. Take specified sample of cleaner, add indicator, and compare with standard color tubes.
   3. With electrometric pH meters. The pH value is measured electrically and read directly. Electrometric pH readings are usually 0.4 pH lower than corresponding colorimetric readings on the same solution. Electrometric pH meters usually employ quinhydrone or glass electrodes, but other types are also available.

E. Determination of Emulsifying Power (Method 1.).
   1. Pour 4 cc. of cleaner into a 10 cc. glass stoppered graduated cylinder.
   2. Add 4 cc. light mineral oil.
   3. Heat cylinder to 180° F. in hot water bath.
   4. Remove cylinder, insert stopper, and shake vigorously 25 times.
   5. Place cylinder on horizontal surface and record time (in minutes) for the oil level to rise to the 3 cc. mark on the graduated cylinder.
   6. Record time as emulsifying power.

F. Determination of Emulsifying Power (Method 2.).
   1. Prepare a small sample of sheet metal or casting of the type to be cleaned.
   2. Coat the sample with a thin, even film of heavy grease. If possible, a grease that duplicates the grease to be removed in production cleaning (and is still heavy enough to be used in the tests) should be selected.
   3. Suspend the greased sample in the cleaner tank for one minute; rinse in warm water; inspect for "water breaks". Repeat this cycle until no "water breaks" can be seen.
   4. Record the total number of minutes needed to clean the sample as the emulsifying power of the solution.

G. Standards:
   1. The proper strength depends upon the commercial cleaner being used and the base metal being cleaned. For cast iron and steel, the caustic soda content may run 2 to 2.5 ounces per gallon; for brass and copper it should be 1.5 ounces per gallon; for zinc and aluminum it should be less than 1.5 ounces per gallon.
   2. The proper pH to maintain also depends on the base metal being cleaned, and varies the same way in which the cleaner strength varies. In electrocleaners most oils can be removed at a pH of 9.0. Zinc or aluminum base metals are attacked above pH 10; tin is at tacked above pH 11; brass is attacked above pH 12; iron is stained above pH 13. Of course, these values vary slightly with the grade of commercial cleaner used and the individual shop conditions, but they may

serve as an indication of the relation between pH of cleaners and the various base metals.

3. Measurements of available alkalinity and emulsifying power are purely relative, and vary with every cleaner. Such tests should be made when a cleaner is new, and checked frequently during the life of the cleaner. When the values of available alkalinity and emulsifying power fall below a certain value, the cleaner should be discarded. This limiting value must be determined by correlation of production conditions with a certain cleaner, but once it has been determined, it will serve as an indication of cleaner life and activity.

Pickling Acids

A. Determination of Acid Strength by Analysis.

1. Pipette a 10 cc. sample of pickling acid into a 250 cc. flask.
2. Add 100 cc. water and 3 drops of methyl orange indicator.
3. Titrate with 1.0 normal sodium hydroxide until the pink color changes to a yellow or straw color. If the pickling acid contains much iron, the color change will be from pink to a dirty green.
4. Cc. of sodium hydroxide used in (3) X .380 equals percent of hydrochloric acid. Cc. of sodium hydroxide used in (3) times .422 equals percent of sulphuric acid. Cc. of sodium hydroxide used in (3) times .252 equals percent of nitric acid.

B. Determination of Acid Strength by Beaume Hydrometer.

1. Read hydrometer and refer to tables of acid strength listed herewith:

HYDROCHLORIC ACID (muriatic)

Beaume degrees	Per cent hydrochloric acid
1.0	1.40
2.0	2.82
3.0	4.25
4.0	5.69
5.0	7.15
6.0	8.64
7.0	10.17
8.0	11.71
9.0	13.26
10.0	14.83
11.0	16.41
12.0	18.01
13.0	19.63
14.0	21.27
15.0	22.92
16.0	24.57
17.0	26.22
18.0	27.92
19.0	29.65
20.0	31.45

SULPHURIC ACID

Beaume degrees	Per cent sulphuric acid
1.0	1.02
5.0	5.28
10.0	10.77
15.0	16.38
20.0	22.25
25.0	28.28
30.0	34.63
35.0	41.27
40.0	48.10
45.0	55.07
50.0	62.18

NITRIC ACID

Beaume degrees	Per cent sulphuric acid
0.5	1.0
3.6	5.0
4.4	6.0
5.2	7.0

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From day to day, many interesting letters are received from readers of PRODUCTS FINISHING. Some request technical information — others are endeavoring to locate sources of supply for materials and equipment — many tell of their great interest in the constructive, helpful articles contained in the various issues.

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Cleveland, Ohio

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6.7	9.0
7.5	10.0
8.2	11.0
9.0	12.0
10.0	12.86
11.0	14.13
12.0	15.41
13.0	16.72
14.0	18.04
15.0	19.36

C. Determination of Acid Strength with a Kocour Pickle Test Set.
   1. This set operates on the principle of Method A, and is quite similar to Method A in operation.

D. Determination of Percent Iron Sulphate in Sulphuric Acid.
   1. Pipette a 10 cc. sample of pickling acid into a 250 cc. flask.
   2. Add 1 drop of 1 per cent diphenylamine solution.
   3. Titrate with .658 normal potassium dichromate to the appearance of a violet color.
   4. Each cc. potassium dichromate used in (3) equal 1 per cent iron sulphate in the acid.

E. Determination of Copper in Pickling Acids.
   1. Pipette a 25 cc. sample of pickling acid into a 250 cc. beaker.
   2. Add 25 cc. distilled water.
   3. Add concentrated ammonia until the solution turns dark blue Then add 5 cc. excess ammonia.
   4. Filter the solution through semifine filter paper and wash the blue color out of the paper. Discard paper.
   5. Boil the filtrate until the odor of ammonia is faint.
   6. Cool slightly and add 5 cc. glacial acetic acid. Boil 1 minute.
   7. Cool to room temperature and add 30 cc. of 10 per cent po-

Prominent Men and Interesting Subjects Feature A. E. S. Convention

The following is a partial list of the speakers and papers to be presented:

Walter Meyer, General Electric Co., Bridgeport, Conn.
Subject: The Effect of Metallic Impurities on the Structure of Cyanide Copper Deposits.

George Hogaboom, Hanson-Van Winkle-Munning Co., Matawan, N. J.
Subject: History of Metal Coloring.

Floyd Oplinger, R. & H. Chemicals Div. of DuPont Co., Niagara Falls, N. Y.
Subject: To be announced.

Ed. Bucy, Zapon Division, Atlas Powder Co., Stamford, Conn.
Subject: Industrial Finish Manufacture.

W. Pinner & G. Borchardt, General Spring & Bumper Co.
Subject: Importance of Correct Anode Corrosion in Electrodeposition of Nickel.

Gustave Soderberg, The Udylite Co., Detroit, Mich.
Subject: Bright Nickel.

Dr. Mitchell, Magnus Chemical Co., Garwood, N. J.
Subject: Use of Solvent Emulsions in Metal Cleaning.

Dr. Wm. Blum, Bureau of Standards.
Subject: Report.

Paul Strausser, A.E.S. Research Man, U. S. Bureau of Standards.
Subject: Report.

tassium iodide.

8. Titrate with .1 normal sodium thiosulphate until the brown color becomes faint. Add 2 cc. of 1 per cent starch solution.
9. Continue the titration until the blue color just disappears.
10. Total cc. of thiosulphate used in (9) times strength of sodium thiosulphate times 5.36 equals ounces per gallon copper in the acid.

F. Standardization of Sodium Thiosulphate with Copper.

1. Weigh out a .2 gram sample of pure copper foil.
2. Place foil in 250 cc. erlenmeyer flask and add 5 cc. of concentrated nitric acid.
3. Boil until the brown fumes are completely exhausted and copper is dissolved.
4. Cool slightly and add 50 cc. distilled water.
5. Add 15 cc. concentrated ammonia.
6. Boil until the odor of ammonia is faint.
7. Cool slightly and add 5 cc. glacial acetic acid. Boil 1 minute.
8. Cool to room temperature and add 30 cc. of 10 per cent potassium iodide.
9. Titrate with .1 normal sodium thiosulphate until the brown color becomes faint. Add 2 cc. of 1 per cent starch solution.
10. Continue the titration until the blue color just disappears.
11. Strength of sodium thiosulphate (grams of copper per 1 cc. of sodium thiosulphate) equals grams of copper in (1) divided by cc. of sodium thiosulphate in (9 and (10).

G. Standards.

1. The proper operating values of acid strength and allowable limits of contamination will depend enirely upon the process being used and the type of work being run. Since this field is so broad, no general standards and limits can be set.

Acid Copper Solution

A. Determination of Free Sulphuric Acid.

1. Pipette a 10 cc. sample of copper solution into a 250 cc. flask.
2. Add 100 cc. water and 3 drops methyl orange indicator.
3. Titrate with 1.0 normal sodium hydroxide until the color of the solution changes from violet to pale green.
4. Cc. of sodium hydroxide used in (3) times. .659 equals ounces per gallon of free sulphuric acid.

B. Determination of Copper by Beaume Hydrometer.

1. Read Beaume Hydrometer and record value of combined copper sulphate and sulphuric acid found in the following table.
2. Subtract from the value of (1) the ounces per gallon of free sulphuric acid found in A-4 above.
3. Record this difference as ounces per gallon copper sulphate.
4. Table of degrees Beaume and concentration:

Beaume degrees	Copper sulphate plus sulphuric acid in oz. per gal.
10	16.6
11	18.3
12	20.0
13	21.9
14	23.8
15	25.7
16	27.8
17	29.8
18	31.8
19	33.8

20	35.9
21	38.1
22	40.4
23	42.8
24	45.0
25	47.3

C. Determination of Copper Sulphate.
1. Pipette a 5 cc. sample into a 250 cc. flask.
2. Add 50 cc. water.
3. Add concentrated ammonia until the solution turns dark blue. Then add 5 cc. excess.
4. Boil until the odor of ammonia becomes faint.
5. Cool slightly and add 5 cc. glacial acetic acid.
6. Boil 1 minute.
7. Cool to room temperature and add 20 cc. of 10 per cent potassium iodide.
8. Titrate with the .1 normal sodium thiosulphate until the brown color almost disappears.
9. Add 2 cc. of 1 per cent starch solution and continue the titration until the blue color just disappears.
10. Total cc. of sodium thiosulphate used (8) and (9) times strength of sodium thiosulphate times 66.9 equals ounces per gallon of copper sulphate.

D. Determination of Free Sulphuric Acid and Copper Sulphate with Kocour Set "AC".
1. This method is strictly a combination of Methods A and B above.

E. Standards.
1. Copper sulphate 20 to 30 ounces per gallon.
2. Free sulphuric acid 6 to 8 ounces per gallon.

Cyanide Copper Solution

A. Determination of Free Sodium Cyanide.
1. Pipette a 10 cc. sample of cyanide copper plating solution in-

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to a 250 cc. erlenmeyer flask.
2. Add 80 cc. of distilled water and 10 cc. of 10 per cent potassium iodide solution.
3. Titrate with .1 normal silver nitrate until a faint, but permanent cloudiness forms.
4. Cc. of .1 normal silver nitrate times .131 equals ounces per gallon of free sodium cyanide.

B. Determination of Free Sodium Cyanide with A Kocour Test Set "CN."
1. This method is exactly the same as Method A.

C. Determination of Copper.
1. Pipette a 10 cc. sample of cyanide copper solution into a 250 cc. flask.
2. Add 5 cc. concentrated sulphuric acid and 1 cc. concentrated nitric acid. (Perform under a hood — poisonous cyanide fumes).
3. Boil until dense white fumes are evolved.
4. Cool and add 50 cc. water.
5. Add concentrated ammonia until the solution turns dark blue. Add 5 cc. excess.
6. Boil until the odor of ammonia becomes faint.
7. Cool and add 5 cc. glacial acetic acid.
8. Boil 1 minute.
9. Cool to room temperature and add 20 cc. of 10 per cent potassium iodide.
10. Titrate with .1 normal sodium thiosulphate until the brown color becomes faint.
11. Add 2 cc. of 1 per cent starch solution and continue the titration until the blue color just disappears.
12. Total cc. of sodium thiosulphate used (10) and (11) times strength of sodium thiosulphate x 13.4 equals ounces per gallon of metallic copper in the solution.

D. Determination of pH.
1. Use pH papers.
2. Use color comparator set.
3. Use pH meter for electrometric measurement.

E. Determination of Sodium Carbonate.
1. Pipette a 10 cc. sample of cyanide copper solution into a 250 cc. beaker.
2. Add 1 cc. concentrated ammonia and 100 cc. distilled water.
3. Add 35 cc. of 10 per cent barium chloride solution and heat to boiling.
4. Cover with a watch glass and let stand hot (not boiling) for 30 minutes.
5. Filter through semi-fine filter paper and wash with hot water until the washings do not turn phenolphthalein indicator pink
6. Transfer filter paper and precipitate to original beaker and add 100 cc. hot distilled water. Break up paper with glass stirring rod.
7. Add 3 drops methyl orange indicator.
8. Titrate with 1.0 normal acid (hydrochloric or sulphuric) until a permanent pink color appears.
9. Cc. of 1.0 normal acid times .706 equals ounces per gallon sodium carbonate.

F. Determination of Rochelle Salt (Potassium Sodium Tartarate) (Method of Dr. Weisberg to be used in controlling the new Rochelle Salt bath.)
1. Pipette a 5 cc. sample of copper solution into a 250 cc. flask.
2. Add 1 cc. of concentrated hydrochloric acid and boil, keeping volume above 2 cc. (Perform under hood — poisonous vapors). Solution turns green when operation is completed.
3. Add 50 cc. of distilled water

and 1 gram of zinc dust. Shake solution gently for about 5 minutes.

4. Filter through a semi-fine filter paper and wash thoroughly. Filtrate should be clear and colorless.
5. Add 5 cc. of concentrated sulphuric acid and 1 gram of manganous sulphate crystals.
6. Heat to almost boiling and titrate with .1 normal potassium permanganate, adding about 2 cc. excess.
7. Add 5 to 10 cc. of .1 normal oxalic acid.
8. Heat to almost boiling again and titrate with the permanganate until the pink color persists for 1 minute or more.
9. Total cc. of .1 normal potassium permanganate used (6) and (8) minus cc. of .1 normal oxalic acid added in (7) times .125 equals ounces per gallon Rochelle Salt.

G. Standards.

1. Free sodium cyanide: (a) .5 to 2.5 ounces per gallon. (b) .5 ounces per gallon (Rochelle Salt bath.).
2. Metallic copper: 2 to 5 ounces per gallon.
3. pH: (a) 11.0 to 12.2.
   (b) 11.0 or less to minimize nasal irritation.
   (c) 11.3 (Rochelle Salt bath).
4. Sodium Carbonate: 2 to 13 ounces per gallon.
5. Rochelle Salts: 6 to 8 ounces per gallon (Rochelle Salt bath).

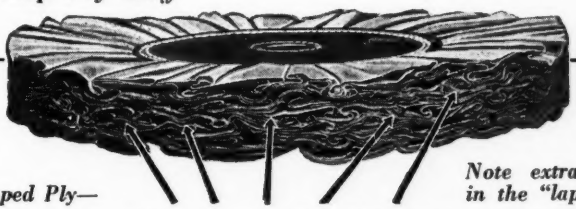
Chemical Publishing Co. of New York, Inc., Catalog No. 6. A 150-page spiral bound catalog designated as "No. 6" and describing chemical, bacteriological, pharmaceutical, medical, engineering, electrical and general scientific and other technical books of all American and British publishers is now being offered to technical workers by the Chemical Publishing Co. of New York, Inc., 148 Lafayette St., New York. Catalog No. 6 will be mailed to any chemist, engineer, scientist or professor by sending 10 cents in stamps or coin to cover mailing.

This catalog eliminates the necessity of filing and looking through catalogs of many technical publishers, thus saving a great deal of time and effort.

Mention PRODUCTS FINISHING when writing to advertisers.

SPEED AND ECONOMY IN THE POLISHING ROOM

the Overlap Ply Buff



The Lapped Ply—

Note extra Surface in the "lapped ply"

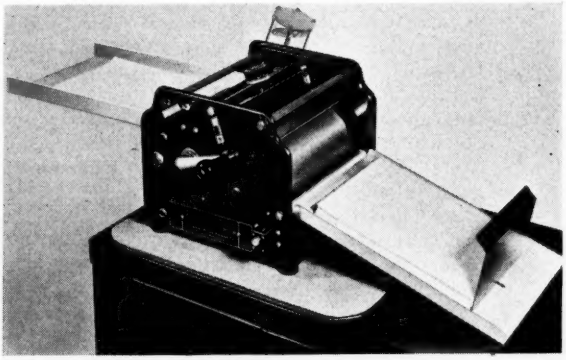
— doubles the polishing surface — increases the cutting power — requires less polishing compound — never streaks work — cloth is formed so that every thread contacts the work, threads never pull out or ravel. *Try a few sections in your shop.*

BIAS BUFF & WHEEL CO. • 430 Communipaw Ave. JERSEY CITY, N. J.

Canadian Agents: La Products Co. 686 Notre Dame St. West, Montreal.

FINISHES THAT AID IN APPEARANCE AND UTILITY

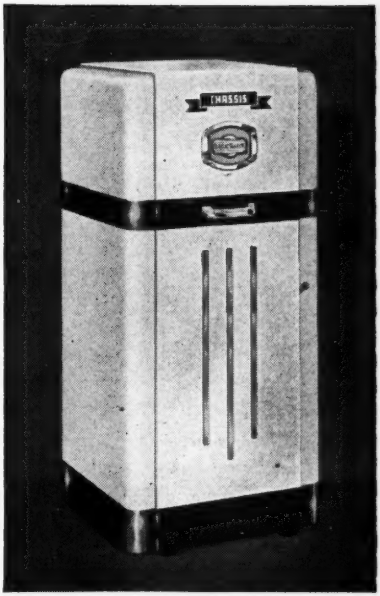
(Right) — The Standard New Process Duplicator Model SW shown herewith is finished with a special type of green suede finish. This finish is not affected in any way by the duplicating fluid used in the machine. Moreover, the finish can be baked on at the low temperature of 225 deg. F. It gives excellent adhesion to a polished aluminum surface on which no previous preparation has been made.



(Photo Courtesy Standard Mailing Machines Co.)

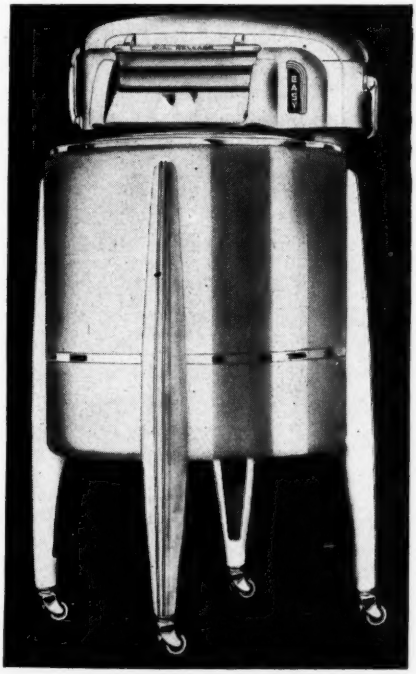
(Photo Courtesy Ludlum Steel Company)

(Left)—This is an illustration of one corner of the interior of a metal covered bathroom. The metal itself is very thin and has a semi-brilliant finish.



(Right)—This chassis lubrication dispenser is finished with a baked white enamel finish over primer and Metalprep. The base band is black and the midway band is red. The lettered banner is applied by a silk screen process. The handles and vertical front stripes are chromium plated.

(Photo Courtesy The Cincinnati Ball Crank Co.)



(Photo Courtesy Easy Washing Machine Corp.)

(Left)—Underneath the baked enamel finish of this modern washing machine, the surface of the metal has been chemically rust proofed by Bonderizing. All decorative beading is chromium plated.

NEWS OF THE INDUSTRY

Third Annual Porcelain Enamel Institute Forum To Be Held in Urbana, Illinois, in October

The Third Annual Porcelain Enamel Institute Forum will be held at the University of Illinois in Urbana, Ill., October 12, 13 and 14, 1938, according to a recent announcement by Mr. F. E. Hodek, Jr., General Porcelain Enameling & Mfg. Co., Chairman of the Forum Committee. This Forum is an annual affair of the Porcelain Enamel Institute, devoted exclusively to the problems of the shop man in the porcelain enameling industry. Papers of a semi-technical nature dealing with shop problems are presented by authorities in various fields. These papers are then followed by open discussions of the subject.

It is expected that there will be a large attendance of the plant men in the industry. Details of the program will be announced later.

Detroit Rex Opens Pacific Coast Office

Detroit Rex Products Company, 13017 Hillview Ave., Detroit, Mich., manufacturers of degreasing machines, solvents, cleaners and strippers, has opened a branch office at 5905 Pacific Blvd., Huntington Park, California. This office will serve the southwest section of the United States. A warehouse located at Los Angeles will carry ample stocks of solvents, so that immediate delivery can be made to all points in this territory.

Norton Company Appoints Resident Manager in Chippawa, Ont.

According to a recent announcement, the Norton Company, Worcester, Mass., has appointed Milton P. Higgins as resident manager of the Chippawa, Ontario, electric furnace plant. Mr. Higgins, who will assume his new duties at the Chippawa plant, has been with the company about ten years and has had experience in both sales and production. Recently he has been manager of sales research. He is also a member of the Board of Directors of the Norton Company.

Oliver H. Van Horn Company, Inc. Appointed Distributor of Stanley Electric Tools

Oliver H. Van Horn Company, Inc., New Orleans, La., with branches at Houston, Texas, Shreveport and Baton Rouge, La., has been appointed distributor for the complete line of Stanley electric tools, according to a recent announcement made by Stanley Electric Tool Division, The Stanley Works, 138 Elm St., New Britain, Connecticut. Oliver H. Van Horn Company, Inc. is well known in the South as an outstanding supply distributor.

Hammond Machinery Builders Appoint Two New Representatives

An announcement of the appointment of two new representatives was recently made by the Hammond Machinery Builders, Inc., 1601 Douglas Ave., Kalamazoo, Michigan. Mr. Arthur E. Smith, 320 Jackson Bldg., Buffalo, N. Y., was appointed as representative in Western and Central New York in the sale of grinders for foundry use. Mr. William C. Edgar, Oliver Bldg., Pittsburgh, Pa., was appointed as representative in Western Pennsylvania and Northern West Virginia in the sale of grinders for foundry use.

BY THE

LEA METHOD OF FINISHING

METALS FOR MODERN BUILDINGS

PERMANENT • EXHIBITION
EXTERIOR • INTERIOR

As an example of the fine work being done by fabricators making use of the LEA Method for finishing metals for modern buildings, take one of the most attractive and most frequently visited buildings in the recent World's Fair at Chicago. Both the interior and exterior were fabricated largely of Apollo ChromCopper supplied by the Apollo Metal Works of Chicago. All of it was satin-finished by the LEA method.

Leading firms supplying architectural or ornamental metals are using the LEA Method to produce the desired finishes at low cost.

BUILDERS' HARDWARE

Another important division of construction materials that for years have been finished by the LEA Method.

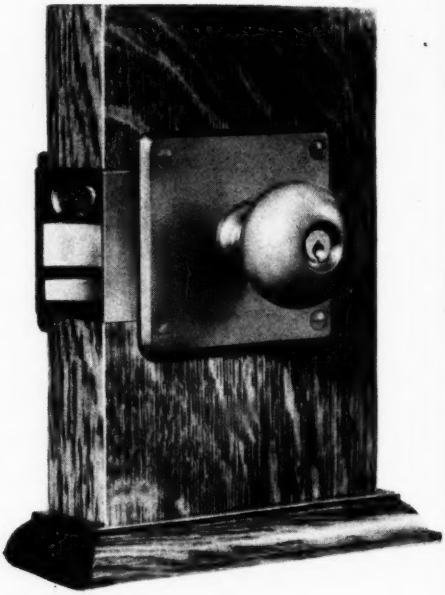
Locks, knobs, door pulls, checks, and other kinds of builders' hardware are produced in large quantities. Therefore, it is essential that unit finishing costs be cut to a minimum . . . that operations be reduced or even eliminated whenever possible. Here the LEA Method of finishing fits nicely into the picture. It is applicable to practically all kinds of finishes.

The hardware illustrated on this page was loaned to us through the courtesy of P. & F. Corbin, New Britain, Conn.

There is hardly any end to the list of articles finished satisfactorily and at low cost by the LEA Method. It is applicable to all kinds of metals and to other materials such as plastics, rubber, and wood. It is ideal for finishing enameled surfaces or for preparing surfaces for lacquering without intermediate steps.

The LEA Method makes use of one or both of two clean, fast-working compositions, each made in a large number of grades. LEA Compound is *greaseless*. LEAROK, a very dense buffing bar, *has no free grease*.

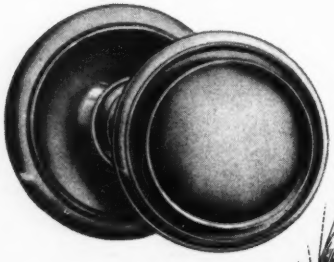
Manufacturers of articles, regardless of style or finish, who are not satisfied with quality or cost of finishing, are invited to submit their problems to our technicians.

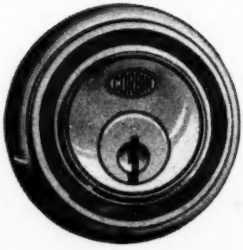


THE LEA MFG. CO.

WATERBURY, CONNECTICUT

Specialists in the Production of Clean-working Buffing and Polishing Compounds





Both Mr. Smith and Mr. Edgar are well known to the foundry trade and have been working with foundries in their sections for a number of years. Their experience, incorporated with Hammond Machinery Builders' 57 years of building high grade machinery, will amply provide a foundation which should be helpful to those having grinding problems or considering grinding equipment.

Ashland Plant of Armco Expands

Mr. F. E. Vigor, manager of the Ashland plant of The American Rolling Mill Company, announced recently that $175,000 will be spent to improve the plant here.

The program includes improvements to blast furnaces as well as the purchase of new equipment. Part of the work will be started immediately.

"The reason Armco is going ahead and making these improvements at this time when operations are low in the entire steel industry is that the management wants to provide just as much employment as possible," Mr. Vigor said.

Harrison G. Travis Promoted to Position of General Sales Manager for Schwartz Manufacturing Company

Mr. Harrison G. Travis, who maintains sales offices at 1 Linden Ave., Locust Point, Locust, N. J., has been promoted to the position of general sales manager for the Schwartz Manufacturing Company, Two Rivers, Wisconsin.

Mr. Travis possesses unusual engineering ability as regards the product that he sells. His experience covers many years in this particular field. He has been connected with the Schwartz Manufacturing Company for the past five years. Until recently, Mr. Travis maintained his residence and sales offices at Matawan, New Jersey.

Mr. R. C. Vaughn Joins Harnischfeger Corporation

The Harnischfeger Corporation, manufacturer of overhead traveling cranes, with main offices located in Milwaukee, Wisconsin, announces the appointment of Mr. R. C. Vaughn as Sales Engineer working from the P&H New York offices. Mr. Vaughn, who has had over twenty years of experience in the sales of electric hoists and overhead traveling cranes in the New York area, has many friends throughout the industrial world who will be anxious to wish him luck in his new business affiliation.

Sheffler-Gross Appointed Agents for Adsco Products

The Sheffler Gross Co., Drexel Bldg., Philadelphia, Pa., manufacturers agents for heating equipment, has been appointed representatives for Eastern Pennsylvania by the American District Steam Company, North Tonawanda, N. Y., manufacturers of Adsco expansion joints, tile conduit, meters, water heaters, and so on.

Pangborn Opens Office in Springfield, Massachusetts

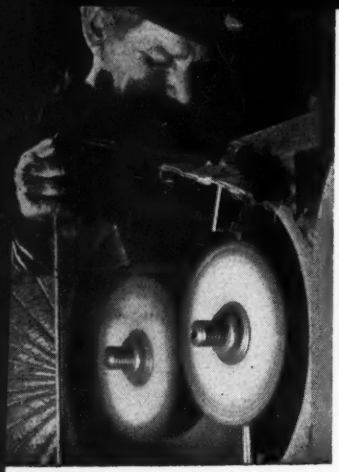
Pangborn Corporation, Hagerstown, Md., announces the removal of their New England Offices to 175 State St., Springfield, Mass., to be in charge of Mr. J. H. Connolly, who was previously connected with the Company's Detroit Office. Mr. Connolly's experience as district sales engineer in Detroit and previous experience in the capacity of erecting superintendent and service engineer for the Pangborn Corporation fully qualifies him to serve Pangborn's many friends and customers in the New England area.

Dr. H. E. Fritz Will Head New Goodrich Synthetic Sales Department

Dr. Howard E. Fritz, who for years headed the Chemical Sales Division of The B. F. Goodrich Company, Akron, Ohio, has been placed in charge of the newly-formed Synthetic Sales Department of that company.

During the past year Dr. Fritz has devoted his entire efforts to the development and sale of Goodrich synthetic elastic known as Koroseal. In view of the increasing number of such materials, which are being made available to the rubber industry, it was deemed advisable to correlate the promotion of all synthetic elastics under a single head. With the creation of this new department, the B. F. Goodrich Company feels that it will be able to offer its customers a wider and a more intelligent service regarding the application of these materials.

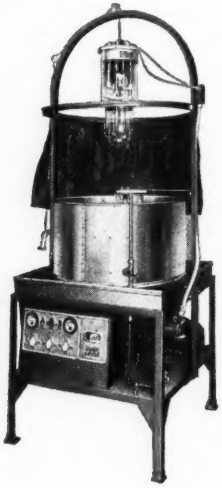
Mention PRODUCTS FINISHING when writing to advertisers. Your cooperation will be appreciated both by the advertiser and this magazine.



NEW
Plant Equipment & Materials

Atlas Weather-Ometer

Weather can be duplicated and accelerated in the plant laboratory for testing durability of finish by means of the Atlas Weather-Ometer which has been recently placed on the market by Atlas Electric Devices Co., 361 W. Superior St., Chicago, Illinois. The Weather-Ometer is a self-contained laboratory machine



Atlas Weather-Ometer

which is said to permit predetermination of the color stability and the resistance of finishes to all types of weather conditions. This machine duplicates and accelerates the action of sun, rain, heat and cold and permits manufacturers to use more durable finishes or at least to know how well the finishes they are using will withstand constant attacks of weather.

The Atlas Weather-Ometer is being used to good advantage in many plants in the field of organic films such as paints, varnishes and lacquers. Paints serve the dual purpose of preservation and decoration; are applied under a wide variety of conditions; and are expected to withstand for a relatively long period of time the onslaught of light, heat and extremes of temperature collectively.

The Atlas Weather-Ometer consists of a special weathering cabinet with two types of water sprays, a special violet carbon arc lamp enclosed in pyrex, a revolving specimen or sample drum and an electric control cabinet. Breakdowns in the Weather-Ometer occur in the same sequence as outdoors, thus providing scientific data to guide production.

Light, heat and water are directed alternately upon prepared specimens which fit into grooved receptacles on the revolving drum which completely surrounds the arc.

The elements produced in the Weather-Ometer cause expansion and contraction and produce results similar to those of actual outdoor weathering.

Aminco-Brenner Magne-Gage

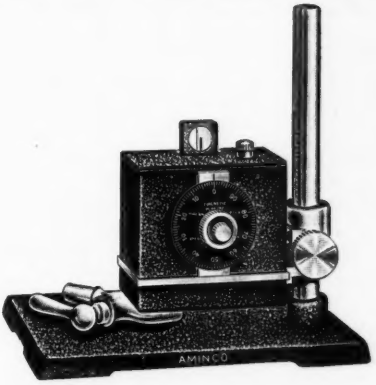
American Instrument Company, 8012 Georgia Ave., Silver Spring, Md., has recently placed on the market an instrument for measuring the thickness of coatings on metals, to be known as the "Aminco-Brenner Magne-Gage." This instrument is a magnetic spring balance by means of which the force of attraction of a small permanent magnet to any type of surface, such as plane, con-

vex or concave, is indicated on a graduated dial of the instrument. The thickness corresponding to the dial readings is determined by calibration curves supplied with the instrument.

The Magne-Gage can be applied in measuring nickel coatings on non-magnetic base metals such as brass, copper, zinc, and so on. It can be used for non-magnetic coatings on magnetic base metals where the coatings may be metallic such as copper, zinc, cadmium, tin, lead, and chromium, or non-metallic such as paint, varnish, lacquer, vitreous enamel, and so on where the base metal may be iron or steel. The Magne-Gage can also be applied in measuring nickel coatings on iron and steel. The same type of instrument can be used in all of the above applications except for the size of the magnet and the strength of the spring.

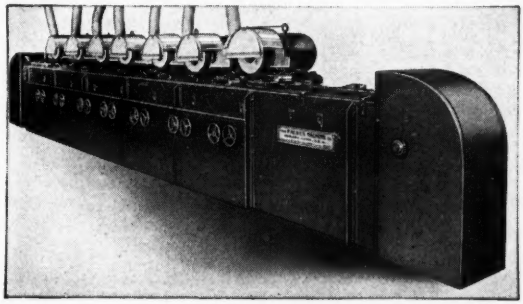
Calibration of the instrument is made at the National Bureau of Standards. The calibration curves of the Bureau are supplied with each instrument.

The measurement of the thickness of coatings on metal by the magnetic method is based on the principle that the force of attraction between a permanent bar magnet and a nickel coating on a non-magnetic base metal is practically proportional to the thickness of the coating. Consequently, if a magnet is calibrated with nickel coatings of known



Aminco-Brenner Magne-Gage

thickness, it serves to measure coatings of other thicknesses. The force of attraction which is measured by the torsion of



New No. 2 Straight Line Conveyor

POLISH and BUFF *Automatically*

Increase your volume production and lower hour costs. More uniform finish. Varied shapes, sizes and metals profitably Polished and Buffed on any one of the three types — Straight Line Conveyor — Rotary — Vertical Portable. Send Sample — Get Proposal — No Obligation.

PACKER *Automatic*

POLISHING & BUFFING MACHINES

THE PACKER MACHINE COMPANY **MERIDEN, CONN.**

a spiral spring is indicated on a dial, and the dial readings are converted into thickness measurements by reference to a calibration chart.

The measurement of thickness of coatings is also based on the fact that non-magnetic materials such as zinc, copper, enamel, paint, and so on, placed between the magnet and a magnet base metal such as iron and steel, decrease the magnetic attraction to an extent that depends upon the thickness of the intervening layer. If a permanent bar magnet is calibrated with non-magnetic coatings of known thickness on iron or steel, it can be used to determine the thickness of other non-magnetic coatings.

The measurement of the thickness of coatings is also based on the fact that a nickel coating over a base of steel exerts only about one-half as much attraction as does the steel and that this attraction is proportional to the thickness of the steel.

The magnetic method for measuring local thickness of coatings has been checked against metallographic measurements and has been found to be accurate within 10 per cent.

Measurements have also been made on about 50 commercially plated plumbing fixtures on each of which the average coating thickness by magnetic measurement was compared with the average thickness obtained by stripping and analyzing the coatings. The two methods agreed within 15 per cent.

pH Wide Range Test Paper

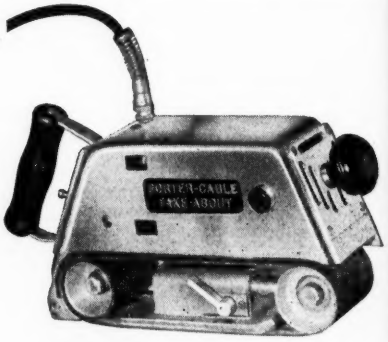
The New HYDRION wide range test paper is used like litmus but gives five distinct color changes:—pH **2**-Red; **4**-Orange; **6**-Yellow; **8**-Green; **10**-Blue. Enables you to keep solutions definitely above or below the points indicated. Very useful as a preliminary test for more precise methods. Inexpensive. You should have HYDRION.

400 STRIPS $1.00 1000 STRIPS $2.00
(Stamps accepted)

R. P. CARGILLE 118 LIBERTY ST. NEW YORK, N. Y.

Porter-Cable "Take-About" Portable Belt Sanding Machine Type T-33

To provide a light weight, yet sturdy and powerful belt abrasive machine for sanding and light grinding operations on metal, Porter-Cable Machine Company,



Porter-Cable "Take-About" Portable Belt Sanding Machine Type T-33.

1708 Salina St., North, Syracuse, N. Y., has just placed on the market the "Take-About" Sander Type T-33.

Endless cloth-backed abrasive belts of any grit, 3 in. wide by 22 in. long, are used on this sander and can be instantly changed by means of a new

MAXIMUM RUST RESISTANCE, DUCTILITY and ATTRACTIVENESS

in your electrodeposits, are easy to obtain when you use Harshaw Pure Anodes and Chemicals.

THE HARSHAW CHEMICAL CO.

Manufacturers, Importers, Merchants
Offices and Laboratories: Cleveland, Ohio
Branch Offices and Warehouse Stocks in Principal Cities

finger-tip lever arrangement. To assure proper cooling of the powerful ¾ H.P. Universal motor that drives the belt, the frame is mechanically designed with front intake slots that permit the air ample circulation area to absorb and carry away the heat. The belt travels 1350 ft. per min. over a flat shoe, thus assuring fast and smooth results.

A shoe pad is available for doing slightly curved surfaces and a bench stand is also available to hold the sander on its side so that the front pulley may be used as a spindle sander.

For both appearance and utility, the Type T-33 has a streamlined, highly polished aluminum frame with cast plastic front and rear handles. The unit is 4¾ in. wide, 7½ in. high and 14¾ in. long and weighs 16 lbs. and is said to be extremely easy to handle and use efficiently. Standard equipment includes six assorted abrasive belts and 15 ft. rubber armored cable fitted with proper unbreakable connecting plugs.

Hanson-Van Winkle-Munning Hopper-Type Barrel Plating Equipment

Automatic handling of barrel plating work is said to have been made commercially practical by the use of hopper equipment designed by Hanson-Van Winkle-Munning Company, Matawan, New Jersey. The workpieces which are processed by means of this equipment are first barrel rolled, or sand rolled and dropped into the hopper of the first tank where they receive a cold water rinse. The work then proceeds from one hopper to another, through a cleaner, a cold water rinse, an acid dip, another cold water rinse, and then to an empty plating barrel cylinder.

After being plated for the required time, the work goes from one hopper to another, through a cold water rinse, then a hot rinse and finally into a Mercil type centrifugal dryer where all the moisture is removed. From the dryer, the work is dropped into a suitable handling receptacle and travels through the plant for further operations.

The lifting of the hoppers for dumping can be effected by hand or by electric hoist, as in the handling of the plating barrel cylinders. The operator can follow a regular routine for normal loads and speeds, handling all the loads in rotation. The plating barrel cylinders can be located in the proper position in the plating tanks and moved ahead if production requires and then dumped into the hopper to remove the work for final cleaning and rinsing operations preparatory to drying.

Several different designs of hoppers are available for use in different locations, depending upon the size of the articles and the shape of the bottom best suited for rinsing and treatment of the work. The hoppers are available in either plain steel or Monel metal. The tanks are plain steel or rubber lined, with bottom drain outlets and substantial overflow dams. Each hopper load is equivalent to the plating cylinder load, which varies from 50 to 150 pounds. Adequate rinsing is

METAL SALTS

FOR PLATING

COPPER

Cyanide; Carbonate

ZINC

Cyanide; Carbonate

Also Nickel, Silver and Gold Salts

1857 COOPER'S CERTIFIED CHEMICALS 1938

CHARLES COOPER & COMPANY

186 Worth Street, New York, N. Y.

Works: Newark, N. J. Established 1857

For a real good polishing job use

KEYSTONE EMERY

Write for Sample

KEYSTONE EMERY MILLS 4316 Paul St., Phila., Pa.

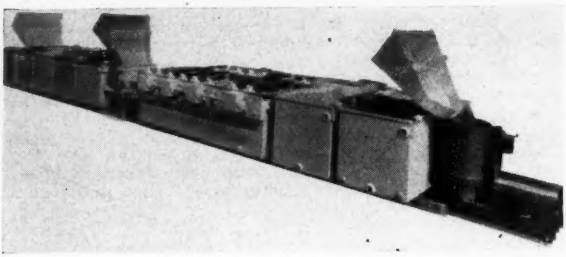


Illustration showing a complete Hanson-Van Winkle-Munning Hopper-Type Barrel Plating Assembly Showing Rinse Tanks, Plating Tank and Mercil Type Centrifugal Dryer.

said to be assured by proper circulation of the liquid through the overflow dam, and for work requiring special treatment, a simple reciprocating device can be added which will continuously swish the hopper through a vertical stroke of about six inches.

Where loads are heavy and the rate of production is high an automatic lifting and lowering of loads by means of a standard Mercil type motor drive is recommended. This drive consists of a ¼ H.P. motor, directly connected to a worm gear reducer with a rubber cushion coupling. A limit switch is said to offer a positive control for raising and lowering the hopper as it is geared directly to the driving unit.

Each tank has an individual motor drive and limit switch, thus permitting the addition of as many hopper units as required, depending on the number of treatments involved and also controlling the entire assembly automatically from a master panel board. The control board is equipped with dials to give selected "dwells" from 20 seconds to 4 minutes per tank. Added safety features are start and stop push buttons and a system of synchronizing all the drives to maintain regularity in the flow of work from tank to tank.

Packer No. 2 Straight Line Conveyor Type Polishing and Buffing Machine

The Packer Company, Meriden, Conn., has recently placed on the market an automatic polishing and buffing machine to be designated as the "No. 2 Straight Line Conveyor Type Polishing and Buffing Machine" for the finishing of a variety of small parts. This machine is of the conveyor type and employs a new style of exterior design, namely that of shielding against abrasive dust. The general appearance of the machine is smooth and graceful, with only the hand wheel controls projecting from the body design.

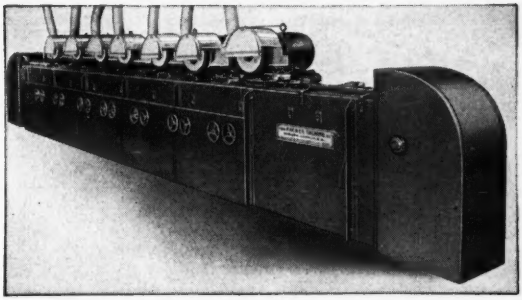
The size of the No. 2 Straight Line Conveyor Type Machine shown herewith

METAL PREP
Checks Paint Failures in the Plant and in the Field
BECAUSE:—
METALPREP
REMOVES grease, oils and drawing compounds.
REMOVES rust and rusting agents.
GIVES a long life to the finish.
ETCHES the metal.
PROVIDES a tooth to which the finish will adhere firmly.
USED after alkali cleaners to destroy alkalinity and its ill effects.
ELIMINATES chipping, peeling and flaking of the finish coats.
METALPREP IS ENDORSED AND RECOMMENDED BY THE LEADING FINISH MANUFACTURERS
Write for Metalprep Circular
NEILSON CHEMICAL CO.
DETROIT, MICH. WINDSOR, ONT.

SMOOTHER SPRAY
—and smoother work, smoother production with the Milburn paint spray gun. Wide, wet spray—easily adjusted.
WRITE FOR NEW CATALOG
The ALEXANDER MILBURN Co.
1436 W. Baltimore St.
Baltimore, Maryland

is 30 ft. 6 in. long and 4 ft. 6 in. wide. This newly designed machine can be furnished with any number of wheelheads depending upon the customer's requirements, thereby increasing or shortening the length of the machine.

The wheelheads are known as the Packer No. 6500 Universal Type, with adjustments for setting the wheels at any angle from horizontal to vertical or any angle within 90 degrees. The wheelheads are arranged with spring balance plates, thus providing a flowing action to the wheels to compensate for any lack of uniformity in thickness of the part to be finished and also permitting the finishing of work in various thicknesses.



Packer No. 2 Straight Line Conveyor Type Buffing Machine.

The wheelheads can be furnished with motors of various horsepower depending upon the customer's requirements, and are also supplied with direct driven wheels or multi-"V" belt driven wheel spindles which are said to permit changing the speed of the wheels necessary for various metals and finishings.

The adjustment for the changing of the position of the wheels is mounted on the front side of the conveyor, as shown in the illustration, permitting the operator to adjust each wheel according to his requirements from the working station or the operating position of the machine.

The conveyor chain is driven by a variable speed unit which permits changing of the speed of the conveyor by adjustment of a control on the drive unit itself. The changing of the speed can be done very quickly by the operator.

All important moving parts on this machine are ball bearing constructed. The carriers to which the work holding fixtures are fastened travel on a solid machine surface track and each carrier is equipped with grease sealed, dustproof, ball bearing rollers. All working parts of the machine are shielded against dirt or abrasive material coming in contact with moving parts.

MAGIC TACK RAGS remove specks, lint and sand particles--- bring out that deep, smooth luster, produce a faultless surface for white or colored finish. Why use "home made" tack rags when you can buy MAGIC TACK RAGS at trifling cost! They are tackier, do not dry--- are dust-proof and spontaneous combustion proof. Packed in dozen and gross lots or more. Made only by the

Wm. A. Juergens Co.
4036-40 Lagrange Street,
Toledo, Ohio, U. S. A.
If your dealer does not carry Magic Tack Rags, write us for sample.

Borolon
TRADE MARK
Strictly first-quality aluminum oxide abrasive polishing grain manufactured in our own electric furnace plant under highest standards of quality and uniformity. Write for samples.
ABRASIVE COMPANY
Grinding Wheel and Abrasive Division of Simonds Saw and Steel Co., TACONY and FRALEY STS., PHILADELPHIA, PA.

Ballou Chrome Finish

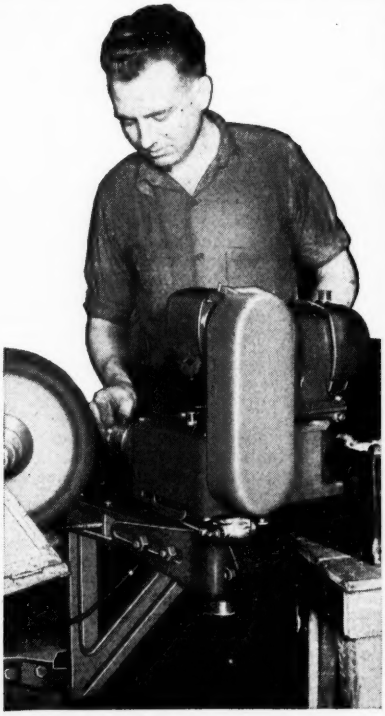
A new product which is said to duplicate a chrome finish has recently been placed on the market by Edward C. Ballou Co., 259 West 14th St., New York, N. Y. This new product is available in paste form to be used in conjunction with a varnish type vehicle or in a ready mixed form. In both forms, the material is said to be satisfactory for dipping, spraying or painting and for air drying and baking. An absolute rub-proof finish can be obtained by baking the product for one-half hour at 250 degrees F.

Ballou Chrome Finish is said to produce a super brilliant finish and is applicable to a wide range of products.

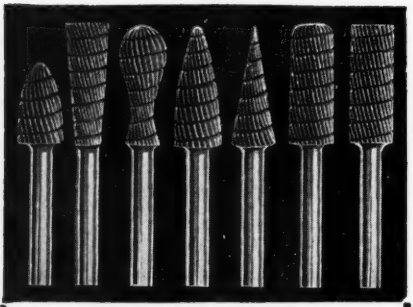
Shakespeare Automatic Buffing Machine

The illustration herewith shows a new automatic buffing machine which was recently placed on the market by Shakespeare Products Co., Kalamazoo, Michigan. The Shakespeare Automatic Buffing Machine is said to take the work straight into the buffing wheel with equal pressure on all critical surfaces. This feature is said to enable contour buffing of soft metals and plastic materials as well as hard buffing of steel and brass parts.

The Shakespeare Automatic Buffing Machine is said to require only 15 minutes or less set up time. Many salvage and small runs can be automatically machine buffed by means of this unit.



Shakespeare Automatic Buffing Machine.



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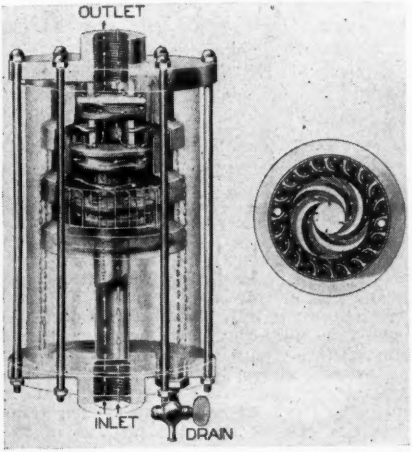
Mfgrs. of equipment and compounds for tumble finishing metals and plastics.

Leaders in the field of tumble finishing

Hager Separator

A compressed air, gas, steam cleaning unit, to be known as the "Hager Separator", has been placed on the market by The Textite Corporation, 2111 Roscoe St., Chicago, Ill. The Hager Separator



Hager Separator

is said to eliminate all possibility of polution and removes all water, oil, dirt, and so on at point of use. The entire cleaning unit measures only 10½ in. high by 6 in. in diameter and weighs 15½ pounds. Cleaning separation is obtained by linear deflection, jetting, centrifugal force, capillary attraction and sudden expansion.

Mounted one above the other in this new separator are three internal vaned units through which the air, gas or steam must travel in succession before it can issue at the top connection. Each unit sets up a rapid whirling movement in the element as long as there is passage through the separator. The whirling motion throws moisture and dirt outward from the center. At the same time the flow is caught by additional sets of vanes curved in the opposite direction and fastened to overlapping sleeves inside the housing.

The reversal following the centrifugal action causes the moisture and dirt to strike the inner surface of the cups where it drops to a collection chamber just inside the shell of the assembly. Flow from the outlet is clean and dry.

The Hager Separator is suitable for pipe sizes to ¾ inch. It is made with a tie-rod assembly of heads and shells so the inside is easily accessible for examination. Metals used in the construction are rust proof and acid resisting.

Davis Cosmetics for Workers

A protective treatment for the hands of industrial workers is now being marketed by the Davis Emergency Equipment Co., 55 Vandam St., New York,

SEVERANCE MIDGET MILLING CUTTERS
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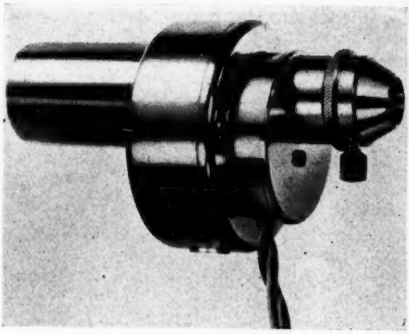
N. Y. The treatment consists in the use of two different creams. These creams are known as No. 1 and No. 2, one for protecting the hands during the work and the other for use after work.

No. 1 cream is rubbed into the hands and on the arms before starting work. An invisible, non-sticky, unnoticeable film is formed which protects the skin from the action of chemicals, solvents, grease, oil, gasoline, and other substances harmful to the skin. When the hands are washed, the film comes off easily and takes with it all dirt, grease, paint, lacquer, and so on, and leaves them smooth and clean.

The No. 2 cream is applied after finishing work for the day. It is said to replace the natural oils of the skin with a soothing cream which keeps the hands soft and free from chapping and cracking. This cream can also be used by those whose hands are constantly wet with water. The No. 1 and No. 2 types are supplied in 16-oz. containers.

Bristol Ardometer Radiation Pyrometer

A radiation pyrometer which uses as a temperature-sensitive unit the "Ardometer" shown in the illustration has been placed on the market by The Bristol Company, Waterbury, Connecticut. The Radiation Pyrometer measures the surface temperature of hot objects or masses above 1000 deg. F. when the Ardometer unit is sighted so that it picks up the heat rays emitted. The temperature can be recorded on one of the Bristol Potentiometers, on a round or strip chart recorder, or on a Millivoltmeter Pyrometer.



Bristol Ardometer for Use with Radiation Pyrometer

The Ardometer can be sighted directly on the object in the furnace and in this position it can measure instantly the temperature of the object itself. The Ardometer is said to follow with fidelity the temperature changes of the material on which it is sighted.

Hisey Infinitely Variable Speed Buffing and Polishing Machine

The illustration shows a buffing and polishing machine so designed that by turning the hand wheel at the top of the machine any desired spindle speed from 1700 to 3500 r.p.m. can be obtained. This machine is a product of The Hisey-Wolf Machine Co., Cincinnati, Ohio.

Speeds can be changed from extreme low to extreme high, or vice versa, in only 11 seconds; thus even less time is

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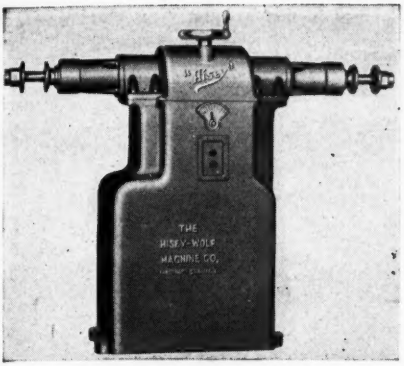

Hisey Infinitely Variable Speed Buffing and Polishing Machine

required for making any intermediate speed change. The speed can be changed while the spindle is in motion and while the machine is operating under load. The speed that the machine is set for is indicated in r.p.m. on the speed dial plate on the front of the machine, which is direct reading. The machine is made in 3, 5 and 7½ h.p. capacities and can be furnished with any Nema motor for any electrical characteristics. It can also be furnished without motor if desired.

Rolock Arc Welded Dipping Baskets and Pickling Crates

Rolock, Inc., 40 Station St., Southport, Conn., has announced the development of arc welded dipping baskets and pickling crates. Among the advantages of the basket is the smoothly welded mesh at the top of the frame. This is said to have done away with the possibility of wires pulling loose and scratching either the work or the hands of the workman. The side and bottom seams are welded with no overlapping or crevices to catch the work.

Rolock arc welded crates are designed for maximum strength with minimum weight. All joints are sealed by welding on all sides, leaving no pockets to hold corrosive acids. The baskets and crates are furnished in a wide variety of designs in nickel chrome, stainless steel, Monel, and plain steel.

Hilo Sparkle Rip-pls Fine Gloss with Gold

A metallic sparkle added to the attractive wave line effect of the Hilo Fine Gloss Rip-pls that is said to give a new finish with brilliance and life has been placed on the market by Hilo Varnish Corporation, 42-60 Stewart Ave., Brooklyn, New York.

Hilo Sparkle Rip-pl may be used on any non-porous surface. It is well suited for air conditioning units, automobile heaters, typewriters, adding machines, toys, and so on. When finished in the manner indicated by the manufacturer, Hilo Sparkle Rip-pls are proof against alcohol, grease, moisture and oil.

The Sparkle Rip-pl effects are obtained by adding Gold Bronze Powder to Fine Gloss Rip-pl in the proportion of 4 oz. Gold Bronze Powder to 1 gallon of Rip-pl.

For best results, Hilo light jade green, pale ivory, and gray Sparkle Rip-pl should be baked at 200 deg. F. for 1½ hours. Red, black, green, olive green, and brown should be baked at 225 degrees F.

Maas & Waldstein Perspiration-Proof Lacquer

A new type of clear lacquer that is said to be resistant to perspiration has

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been developed by Maas & Waldstein Co,. 438 Riverside Ave., Newark, New Jersey. This lacquer can be applied by dipping or spraying and air-dries out of dust rapidly. After hardening for a few days, it becomes practically insoluble to moisture, soap and water, and perspiration. It is useful for finishing products such as flashlights, and other products that are constantly held in the hands.

According to the manufacturer, this lacquer provides a very high degree of protection against rusting. It is supplied in grades suitable for finishing copper, brass, and aluminum.

Paasche Type 3LT Striper

A new striping unit which applies three lines in one striping operation has been placed on the market by Paasche Airbrush Company, 1910 Diversey Parkway, Chicago, Illinois. The Paasche three line striping unit is arranged so that the two outside striping nibs may apply one color and the inner nib another color, or all three lines the same color as desired.

The two outside striping nibs slide back and forth to fit the contour of the surface being striped. Special nibs are designed and built to order to meet the particular requirements.

Paasche Type 3LT Striper

The Paasche Striper may be used in grooves, on edges, on raised portions, and on flat surfaces as well. It is said to be ideal for horizontal or vertical surfaces. The guide which is an integral part of the unit is adjustable to any position to fit any surface.

Hydrion Wide Range Test Paper

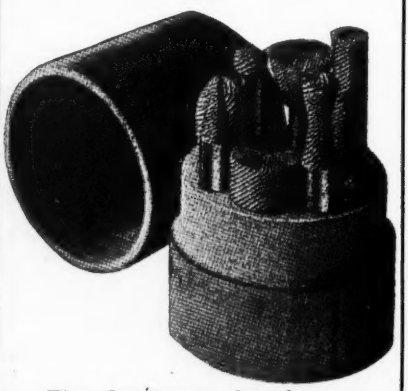
R. P. Cargille, 118 Liberty St., New York, N. Y., has recently placed on the market a wide range test paper to be known as the "Hydrion" for the rapid determination of approximate pH. The new Hydrion Wide Range Test Paper gives five distinct color changes in the range pH 2 to pH 10.

The test papers can be used with turbid and highly colored solutions by observing color of outer diffusion zone on spot tests. The Hydrion Wide Range Test Paper shows the following color changes:

pH	Color
2—Very Strongly Acid	Red
4—Strongly Acid	Orange
6—Weakly Acid	Yellow
8—Weakly Alkaline	Green
10—Strongly Alkaline	Blue

Hydrion Wide Range Test Paper is available in 1 vial containing 100 strips or a carton of 4 vials containing 400 strips.

ROTARY FILES



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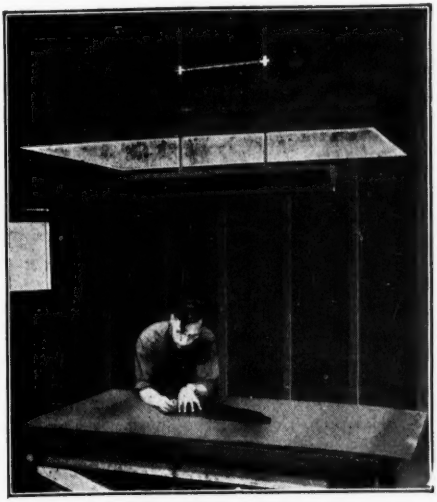
Fostoria Canopy Localite

The line of localized or supplementary lighting units manufactured by The



Fostoria Canopy Localite

Fostoria Pressed Steel Corporation, Fostoria, Ohio, has been augmented by the addition of the Canopy Localite illustrated herewith. This unit was developed to provide a relatively large spread of diffused illumination with a minimum of brightness and glare from the light source.

The Fostoria Canopy unit is made with three sizes of luminaires—20, 40 and 60 in. long—and the smallest size is available on the regular Fostoria Localite supporting arm. The unit is recommended especially for installations where the reflection from bright surfaces is a problem, such as in metal scribing, drafting, inspection work, and so on.

Stanley Wrinkle Finishes

The Stanley Chemical Company, East Berlin, Conn., is now manufacturing their 70F Wrinkle Finishes under a license arrangement with New Wrinkle, Inc. While it has been comparatively simple to obtain good color and gloss in a coarse wrinkle finish, the manufacturer states that the black wrinkle finish is of a very fine texture and has a maximum of gloss.

Stanley 70F Wrinkle Finishes are shipped ready for use. They are manufactured for spray application and should be sprayed with about 40 lbs. air pressure, without any reduction and baked for 2 hours at 250 degrees F. The Stanley 70F Wrinkle Finishes are unaffected by air drying for a reasonable time before baking. Test panels have been air dried for from 5 minutes up to 2 hours baking and good results were found in the final appearance or character of the final wrinkle finish.

Stanley 70F Wrinkle Finishes are so formulated that if a blemish occurs in the finish it may be sanded down to a smooth surface and then retouched with another coating and rebaked with satisfactory results. This is said to be a decided advantage since the area touched up in this manner cannot be distinguished from the remaining single coat area after baking.

Bruce Wax-Pak Li-Vac

Wax-Pak Li-Vac is a lime composition packed in wax paper and has been recently placed on the market by Bruce Products Corporation, 5712 Twelfth St., Detroit, Michigan. Wax-Pak Li-Vac is vacuumized, compressed and formed in one operation at a constant temperature. This composition can be used without unwrapping.

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✓ The Jamestown and
✓ The SAMUELS

FOR YOUR CATALOG LIBRARY

To obtain copies of the catalogs listed here, indicate on the coupon the number of the item in which you are interested and mail as directed.

1. **Dust Collecting System**
Complete information regarding the application of the Roto-Clone for eliminating dust problems. American Air Filter Company, Inc., 142 Central Ave., Louisville, Ky.

2. **Black Finish To Steel**
A 4-page bulletin outlining the Pentrate Process of applying an attractive, low-cost black finish to steel, through a process of chemical action. Heatbath Corporation, Springfield, Mass. See Page 25.

3. **Hand Cut Rotary Files**
Bulletin No. 105 illustrating the line of Ford Hand Cut Rotary Files. M. A. Ford Mfg. Co., 417 Pershing Ave., Davenport, Iowa. See Page 62.

4. **Magic Tack Rags**
Folder describing the advantages of using tack rags for improving finishes. Wm. A. Juergens Co., 4036-40 Lagrange St., Toledo, Ohio. See Page 57.

5. **Pickling and Plating Tanks**
Bulletin D-1 is an 8-page circular illustrating and describing Standard rectangular tanks and accessories. Haveg Corporation, Newark, Del.

6. **Safety Goggles**
Complete Safety Catalog illustrating and describing every style and type of goggle for dusts, chipping, grinding, welding, polishing and acids. Pulmosan Safety Equipment Corp., 176 Johnson St., Brooklyn, N. Y. See Page 31.

7. **Electric Tools**
A 50-page catalog complete with illustrations, descriptions and specifications of portable electric tools including metal-finishing equipment. Stanley Electric Tool Division, The Stanley Works, 138 Elm St., New Britain, Conn. See Page 6.

8. **Tumbling Equipment**
A new bulletin giving information on tumbling equipment and tumbling compounds for metal-finishing in mass production. Lupomatic Tumbling Machine Co., Inc., 4510 Bullard Ave., New York, N. Y. See Page 58.

9. **Industrial Ovens**
Two new bulletins giving full particulars on air heaters and industrial ovens. J. O. Ross Engineering Corporation, 350 Madison Ave., New York, N. Y. See Third Cover.

10. **Paint Spray Gun**
A new catalog is being issued outlining details on the Milburn Spray Gun. The Alexander Milburn Company, 1436 W. Baltimore St., Baltimore, Md. See Page 56.

11. **Metal Cleaning Hints**
An interesting bulletin giving details on Metalprep Rust and Grease Remover. Tells how Metalprep makes metals safe for paint. Neilson Chemical Co., 6564 Benson St., Detroit, Mich. See Page 56.

12. **pH Meters**
A folder giving complete informa-

tion regarding application of the Cameron pH Meters to plating problems. Wilkens-Anderson Co., 111 N. Canal St., Chicago, Ill.

13. **Production Polishing Equipment**
New bulletins have been issued, giving descriptions and specifications of various types of production polishing machines. Acme Manufacturing Co., 1641 Howard St., Detroit, Mich.

14. **Dust Collecting Systems**
An attractive 24-page catalog has just been issued by The Kirk & Blum Mfg. Co., 2816 Spring Grove Ave., Cincinnati, Ohio, which illustrates and describes many K & B Dust collecting Applications installed in numerous industries. See Second Cover.

15. **Spray Booths and Ovens**
Newcomb-David Company, Inc., 5741 Russell St., Detroit, Mich., has issued a 24-page catalog illustrating and describing typical N-D Spray Booths, Industrial Ovens, Metal Parts Washers and Ventilating Equipment.

16. **Washing Machinery**
A useful catalog that has been issued by G. S. Blakeslee & Co., 19th St. and 52nd Ave., Cicero Station, Chicago, Ill., illustrating many types of metal and parts washers in the Blakeslee line.

17. **Bright Nickel Plate**
Details of Seymour Bright Nickel Plate or contained in literature being issued by The Seymour Manufacturing Co., 9 Franklin St., Seymour, Conn.

18. **Disc Sanders**
The Delta Manufacturing Co., 601 E. Vienna Ave., Milwaukee, Wis., has issued literature on metal-finishing equipment including Delta Belt Sanders and Delta Disc Sanders.

19. **pH Papers**
Complete information on pH papers for acid and alkaline solutions is available in literature issued by Paul Frank, 456 Fourth Ave. New York, N. Y.

20. **Tumbling Units**
Lupomatic Type S Tumbling Units are described and illustrated in a 4-page bulletin issued by Lupomatic Tumbling Machine Co., Inc., 4510 Bullard Ave., New York, N. Y.

21. **Automatic Polishing Machines**
The Packer Machine Co., Meriden, Conn., has issued a catalog illustrating and describing the Packer line of automatic polishing and buffing machines. See Page 53.

22. **Analysis of Plating Solutions**
A 24-page booklet containing methods of analyzing plating solutions in practical operations has been issued by Hanson-Van Winkle-Munning Co., Matawan, N. J.

23. **New Airbrush**
Paasche Airbrush Co., 1910 Diversey Parkway, Chicago, Ill., offers a new bulletin giving complete details on the new Paasche Type BU Airbrush.

24. **Plating Barrel**
The Udylite Plating Barrel is completely detailed in a bulletin published by the Udylite Company, 1651 E. Grand Blvd., Detroit, Mich.

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INDEX TO ADVERTISEMENTS

Abbott Ball Company, The 23
Abrasive Company 57
Bias Buff & Wheel Co., Inc. 45
Carborundum Company, The 4
Cargille, R. P. 54
Cooper & Co., Inc. of N. J., Charles 55
DeWitt Operated Hotels 63
Egyptian Lacquer Mfg. Co. 19
Ford Mfg. Co., M. A. 62
Hamilton Tool Co., The 58
Harshaw Chemical Co., The 54
Heatbath Corporation 25
Iding Disc Grinding Compound Co., Inc., M. P. 29
Juergens Co., Wm. A. 57
Keystone Emery Mills 55
Kirk & Blum Mfg. Co., The ..... Second Cover
Lea Mfg. Co. 49-50
Lupomatic Tumbling Machine Co. 58
McGean Chemical Company 59
Mahon Company, The R. C. ..... Fourth Cover
Milburn Company, The Alexander 56
National Sherardizing & Machine Co. 35
Neilson Chemical Co. 56
Norton Company 13
Oakite Products, Inc. 1
Packer Machine Company, The 53
Pennsylvania Salt Manufacturing Co. 3
Philadelphia Quartz Company 27
Pulmosan Safety Equipment Corp. 31
Ross Engineering Corp., J. O. ..... Third Cover
Rumford Chemical Works 61
S. P. I. A. 60
Severance Tool Mfg. Co. 59
Stanley Works 6
U. S. Stoneware Co. 43
Varnish Products Co., The 60
Watson-Standard Co., The 2

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